APPROACHES TO WATER RESOURCE DEVELOPMENT IN CENTRAL AND SOUTHERN FLORIDA, 1845-1947

by

JOHN M. DE GROVE
Assistant Professor of Political Science
University of Florida

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PREFACE

Probably nowhere in the United States does there exist a better natural laboratory for the student of water resource development than in the complex and interrelated drainage basins of the lower Florida peninsula. Today, the numerous and diverse water control problems of that region are being approached through a multi-purpose program, involving cooperative participation by federal, state, and local governments. This undertaking came into being both as a remedial expedient precipitated by the critical flood conditions of 1947, and as a logical sequel in the trend established by the multifarious water control activities of the preceding century. It is this developmental period, 1845-1947—a long record of successes and failures—which Dr. De Grove reviews and objectively analyzes in this study.

To a great extent the activities of the current Central and Southern Florida Flood Control Project are based on the experience of past water control and reclamation programs. This study highlights the instructional value of the past by bringing into focus the significant aspects of the evolution of water resource development in the lower Florida peninsula. Dr. De Grove has provided an exceptionally effective description and interpretation of the problems of administration, economics, and interagency coordination which influenced developments over the first hundred year period of Florida's statehood. He traces the trends and philosophies leading up to the increasing support for the multi-purpose approach and the obvious need for better coordination among governmental agencies. The study culminates with a discussion of the joint data gathering program of the 1930's and 1940's, which provided a factual groundwork for the planning of the present cooperative project.

Experience of the Central and Southern Florida Flood Control District attests the value of studying the past for its benefit to present application. In the same manner, the present should be critically analyzed for its benefit to future guidance. The existing project presents an unusual if not a unique opportunity to test the practicability of increasing the state and local cost-sharing responsibilities in large, cooperative programs. Acute problems arising from the confused nature of national water policy have already been evidenced, and sharply emphasize the need for corrective legislation. The physical basis of water problems in the Florida peninsula inflicts many inherent difficulties on the task of coordinating various agencies and interests, often with inconsistent statutory authority. Such problems as these are continually manifested in any water resource program, and a proper understanding of them holds an invaluable lesson for the future. This suggests a need for more exhaustive study of contemporary developments along the lines initiated here.

Only recently Dr. De Grove has completed an analysis of the progress of the Central and Southern Florida Flood Control Project through 1957. The results of that study will provide a valuable and interesting epilogue to the evolution recounted in the work below. These contributions, although highly significant, represent but a small fraction of the critical study needed in the field of Florida's or the nation's water resource development. It is encouraging to note, however, that Dr. De Grove's plans call for more intensive work of this type in the near future.

W. Turner Wallis, Chief Engineer
Internal Improvement Fund
State of Florida

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APPROACHES TO WATER RESOURCE DEVELOPMENT IN CENTRAL AND SOUTHERN FLORIDA: 1845-1947

INTRODUCTION

During the period 1947-1949 a comprehensive water resources plan was developed for central and southern Florida by the Department of the Army's Corps of Engineers.[1] The area included in the proposed plan consisted of over 15,000 square miles and 17 counties in the central and south Florida area. The boundaries of the region extend from the vicinity of Sanford on the north some 250 miles south to below Homestead. The average width is 75 miles, with a maximum width of 120 miles from West Palm Beach across the state westward to Ft. Myers on the Gulf of Mexico. Although the area contains a number of sub-drainage basins, it is for all practical purposes a single drainage unit, since during periods of high water the various watersheds are joined in floods that cover the entire region. The area may be divided into four distinct sub-watersheds: the upper St. Johns and related areas; the Kissimmee River basin and related areas; the Lake Okeechobee-Everglades area; and the East Coast-Everglades area.[2]

The new plan, calling for a joint federal-state effort to develop the full water resource potential of the area, was approved by Congress and the state of Florida by 1949. Work on the project began in early 1950. The comprehensive project grew out of a complex physical problem that has long defied solution. The problem has been characterized by both too much and too little water. The difficulty of too much water in the low flat country of the area has been clear since the earliest efforts to farm the territory at

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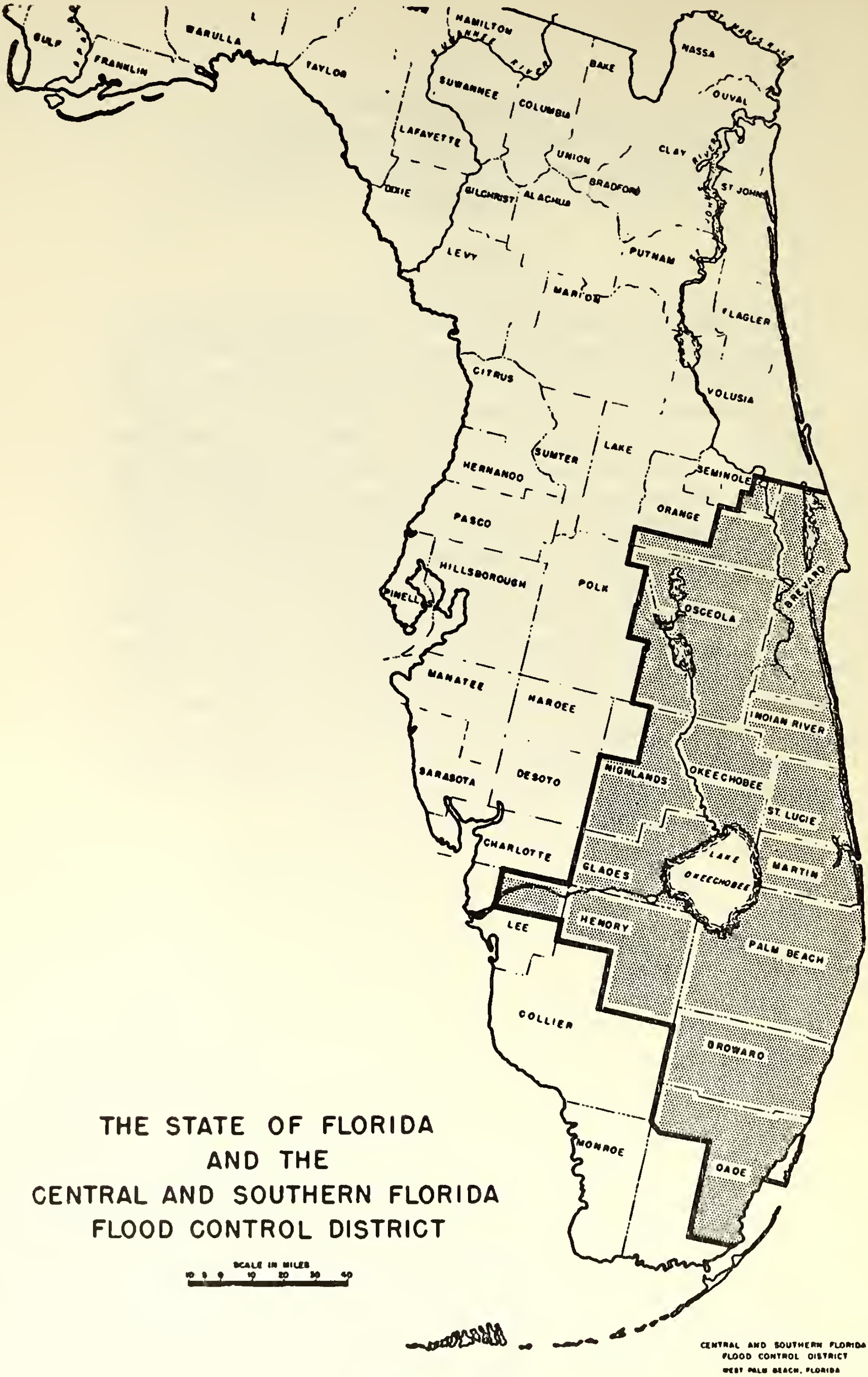
[1] For a brief analysis of this project see William F. Larsen, *The Central and Southern Florida Flood Control Project*, Civic Information Series No. 17 (Gainesville, Florida: Public Administration Clearing Service, 1954).

[2] U.S., Senate, *Comprehensive Report on Central and Southern Florida For Flood Control and Other Purposes*, H.D. 643, 80 Cong., 2 Sess., 1948, pp. 15-16; Florida, *Report to the Bureau of the Budget*, 1953 (West Palm Beach: Central and Southern Florida Flood Control District, 1953), p. 1.



THE STATE OF FLORIDA
AND THE
CENTRAL AND SOUTHERN FLORIDA
FLOOD CONTROL DISTRICT

CENTRAL AND SOUTHERN FLORIDA
FLOOD CONTROL DISTRICT
WEST PALM BEACH, FLORIDA

MAP No. 1

about the turn of the century. Attempts at drainage by private, local and state agencies, largely on a piecemeal basis, were generally unsuccessful in relieving periodic flooding. Since the 1930's the problem of too little water has become increasingly clear. Efforts to drain the surplus water into the ocean did not relieve the flood situation during wet periods, but did cause a shortage of water for irrigation during dry periods. Extended periods of drought during the 1930's were accompanied by extensive muck and peat fires that destroyed thousands of acres of valuable land, the rapid destruction through oxidation of the peat soil, and salt water contamination of lower east coast municipal water supplies.

The problem of an adequate water supply for central and southern Florida was vastly complicated during the 1900-1947 period by the rapid population growth and industrial expansion that characterized the region's development pattern. The area now included in the central and southern Florida water control project increased in population from 26,000 in 1900 to almost 1,000,000 in 1950.[3] Expansion has, of course, been even more rapid since 1950. A large part of this increase during the period was concentrated in the "Gold Coast" counties of Dade, Broward, and Palm Beach. Thus municipal water demands increased sharply at the same time ill-advised drainage of the Everglades threatened available supplies with salt contamination.

This study consists of a selective survey of federal, state, local, and private efforts to solve the water control problem of central and southern Florida from 1845 to 1947. It is selective because the study does not purport to be a general history of the subject during this period. Within a broad historical framework, specific kinds of problems are selected for analysis. These problems are concentrated within the general problem areas of administration, economics, and policy. More specifically, they take the form of an examination of such things as (a) the role played by various federal government agencies in developing the water resources of central and southern Florida; (b) a similar examination of the state and local agencies participating; (c) the effect on the project of the kind of national water policy pursued by the United States during the period; (d) the examination of specific physical problems in the evolution of the water control effort, selected for their direct bearing on the administrative-economic-policy area of concentration; and (e) the nature and effectiveness of intergovernmental cooperation by the various federal, state, and local agencies involved in the project. The 1947 date of termination is used because it marked the start of the new and broader attack on the water control problem in central and southern Florida discussed above. The analysis of the Florida experience will, in turn, be made within the general framework of a brief summary of national water policy problems in the area of administration, finance, and intergovernmental cooperation. The aim will be to attempt to discover whether experience in the evolution of the Florida project is useful in better understanding the general nature of the problems in the areas to be concentrated on. It is also hoped that by better understanding how present patterns in the administration, finance, and federal-state-local fields have evolved, it will be possible to face more realistically the task of making improvements in each of the areas treated.

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[3] Uriel L. ManHeim, *The Florida Everglades, Their Farming Prospects: The Future Land Use Pattern of the Central and Southern Florida Flood Control District,* Area Development Series No. 5 (Coral Gables, Florida: Bureau of Business and Economic Research, University of Miami, 1954), p. 5.

WATER: A GROWING NATIONAL PROBLEM

Both public and private concern over the various phases of water resource development have been greater in the last eight years than at any time in the history of the United States. While it is true that this recent interest has not had as wide a popular appeal as Theodore Roosevelt's conservation crusade at the turn of the century, it is accurate to state that the number of studies in the past decade[4] by both private and governmental organizations exceeds in scope and variety any past effort. These studies comprise thousands of pages of printed matter covering the various aspects of the physical, economic, administrative, policy, and social complexities of water. The traditional pattern of coping with resource problems in the United States only in the face of an emergency atmosphere of acute destruction or threatened shortages has been followed in the emphasis on water problems during the last decade. Two factors have contributed to the crisis atmosphere within which water problems have been treated in recent years: a burgeoning population that apparently will exceed 200,000,000 by 1975; and an amazingly rapid growth in per capita water use that will bring an estimated increase in total consumption from 185 billion gallons in 1950 to 350 billion gallons in 1975.[5] This increase, resulting largely from new and greater demands by industry and agriculture, has produced widespread concern, which in turn has led to renewed efforts to improve our capacity for dealing with water resource problems. Many of the studies mentioned above have focused particular attention on the widespread confusion, duplication, and conflict characteristic of local, state, and federal efforts to develop and control the water resources of the nation. Acute problems in administration, finance, and inter-governmental cooperation present themselves in an interwoven pattern that defies separate analysis. The unity

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[4] A few of the most important studies are: Two volumes of the Commission on Organization of the Executive Branch of the Government, 1949, including *Task Force Report on Water Resources Projects* and *Task Force Report on Natural Resources* (Washington: Government Printing Office, 1949); the three-volume Report of the President's Water Resources Policy Commission, entitled *A Water Policy for the American People*, Vol. I, *Ten Rivers in America's Future*, Vol. II, and *Water Resources Law*, Vol. III (Washington: Government Printing Office, 1950); The Report of the Missouri Basin Sur-

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vey Commission, *Missouri: Land and Water* (Washington: Government Printing Office, 1953); Commission on Organization of the Executive Branch of the Government, 1955, *Task Force Report on Water Resources and Power* in three volumes; A Report by the Presidential Advisory Committee on Water Resources Policy, 1955, *Water Resources Policy* (Washington: Government Printing Office, 1955); Report of the Mid-Century Conference on Resources for the Future, *The Nation Looks at its Resources* (Washington: Resources for the Future, Inc., 1954).

[5] Data on present consumption and estimated future needs taken from Commission on Organization of the Executive Branch of the Government, 1955, *Water Resources and Power, A Report to the Congress*, Vol. I, pp. 3-5 and Proceedings of the Eighth Municipal and Public Health Engineering Conference, March 15 and 16, 1955, *Water Management in Florida*, Bulletin Series 72, *Engineering Progress at the University of Florida* (Gainesville: Florida Engineering and Industrial Experiment Station, College of Engineering, 1955), p. 14.

of these governmental problems can aptly be compared to the unity of nature in resource development that also defies effective and coherent utilization via the single-purpose approach.

THE PROBLEM OF ADMINISTRATIVE DISPERSION

The Second Hoover Commission's *Task Force Report on Water Resources and Power* found 25 "principal agencies" in the federal government with a major part in some phase of the development of water resources. These agencies were scattered among six departments and five independent agencies.[6] Historically, this division of responsibility among so many agencies can be traced to the single-purpose and relatively unrelated development of federal government participation in water resources.

The three agencies of the federal government with the greatest powers and responsibilities in the water resources area are the Department of the Army's Corps of Engineers; the Department of the Interior's Bureau of Reclamation; and the Department of Agriculture's Soil Conservation Service. The navigation functions of the Corps of Engineers represented virtually the sum total of federal government participation in water resource development during the first three-fourths of the nineteenth century—the limited flood control work done was tied directly to the primary navigation function. Major floods near the end of the century produced pressure for broader government action in dealing with floods. Efforts to establish federal government responsibility for dealing with floods on a national scale was long resisted, but the Flood Control Act of 1936 in effect made almost all flood control work across the nation the responsibility of the federal government.[7] In addition, the Flood Control Act of 1944 authorized the Corps to develop "major drainage" projects. This action opened the way for major Corps action in reclamation through drainage projects. This authority was used on a broad scale for the first time in recommending the comprehensive water control plan for central and southern Florida.[8]

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[6] Vol. I, pp. 59-62.

[7] J. S. Ransmeier, *The Tennessee Valley Authority: A Case Study in the Economics of Multiple Purpose Stream Planning* (Nashville: The Vanderbilt University Press, 1942), Chap. 1; James L. Fly, "The Role of the Federal Government in the Conservation and Utilization of Water Resources," *University of Pennsylvania Law Review*, Vol. 86 (1937-38), 274-284; William G. Hoyt and Walter B. Langbein, *Floods* (Princeton: Princeton University Press, 1955), Chaps. 7 and 8. For the text of the 1936 Act see 49 *Stat.* 1570.

Federal responsibility in the field of irrigation dates from 1902, long after major responsibility in the navigation field and limited duties in the flood control area had been undertaken. Under federal irrigation law, primary responsibility for irrigation development lies with the Department of the Interior's Bureau of Reclamation, with the Bureau's authority limited to the 17 Western states. From 1902 until the 1920's, Reclamation concentrated on single-purpose irrigation projects, but a gradual change during the 1920's was climaxed by Bureau of Reclamation development of the Colorado River Project, one of the nation's first large multi-purpose efforts.[9]

The Department of Agriculture, operating mainly through the Soil Conservation Service, was first assigned major water resource responsibility in the upper reaches of the nation's river valleys under the Flood Control Act of 1936. Subsequent legislation established a special watershed treatment program in 11 areas; a pilot watershed program involving 58 projects; and finally a nationwide program for the treatment of small watersheds in 1954, as amended in 1956.[10] A large number of additional agencies of the federal government concern themselves with such problems of water use as drainage, irrigation, hydroelectric power, municipal and industrial water supply, flood control, navigation, pollution abatement, recreation, fish and wildlife management, salinity control, insect control, and sediment control.

While governmental participation in water resource work remained limited, and single-purpose development was the rule, conflict and duplication were kept to a minimum. However, the expansion of governmental effort and the growth of the multi-purpose concept in resource development that began around the turn of the century contributed to the introduction of continuing problems of policy and administration. These problems have come about as previously single-purpose agencies, supported by powerful interest groups, broadened their activities to take into consideration the widely accepted multi-purpose development concept. The classic example of the resulting conflict has involved the Corps of Engineers and the Bureau of Reclamation. The Corps long concentrated its work on the main stem of the nation's rivers in constructing large dams and other structures to give protection chiefly to urban areas. The Bureau, on the other hand, was for many years content to develop irrigation on the upper reaches of the same rivers. The two met in bitter conflict, however, when they adopted the multi-purpose concept and became eager to develop all the water resources of major river valleys. The basic difficulty has been that two or more agencies, operating in different departments, under different statutes, and supported by different interest groups, were (and are) trying to do similar jobs in the same areas.[11] One result of this conflict has been a failure to properly plan, execute, or operate vast water resource development programs that have already cost $14,300,000,000, and according to present plans will cost an additional $18,494,000,000 for projects already authorized.[12]

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[8] 58 *Stat.* 887.

[9] *A Water Policy for the American People*, pp. 150-152; Roy E. Huffman, *Irrigation Development and Public Water Policy* (New York: The Ronald Press, 1953), pp. 24-32.

[10] U. S., House, Subcommittee of the Committee on Appropriations, *Hearings, Department of Agriculture Appropriations for 1958*, 85 Cong., 1 Sess., pp. 1785-1847. The statute citations are 60 *Stat.* 666 and 70 *Stat.* 1088.

The most significant efforts to correct faulty coordination of water resources development at the federal level have come from the executive rather than the legislative branch. Theodore Roosevelt in 1908, Herbert Hoover in 1932, and many others, have advocated basic policy and administrative changes designed to bring order to the nation's water resources program. The most persistent recommendation of various water resource study groups has been that the civil functions of the Corps of Engineers be given to a reorganized civilian water resources division. This new agency would be placed either in a new Department of Natural Resources, or in a reconstituted Department of the Interior. Although this proposal has been supported by a great many students of the problem, it has never received the serious consideration of Congress. During recent years, reorganization proposals have shown a definite retreat from this supposedly extreme position. Some recent proposals have contended that a central board of review, probably located in the Executive Office of the President, coupled with stronger federal inter-agency river basin committees, would be satisfactory administrative remedies.[13] One of the most dramatic moves to end agency overlap and conflict in the area of water resource development took place with the authorization of the Tennessee Valley Authority in 1933. This agency was given broad authority for all phases of resource development in the seven-state TVA area. While most students of the problem agree that the valley authority experiment has been very successful in the Tennessee Valley, there is little support for extending this device to other river basins across the country.[14]

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[11] Charles McKinley, *Uncle Sam in the Pacific Northwest: Federal Management of Natural Resources in the Columbia Valley* (Berkeley: University of California Press, 1952), pp. 89-99; *A Water Policy for the American People*, pp. 4-5; Arthur Maass, *Muddy Waters: The Army Engineers and the Nation's Rivers* (Cambridge: Harvard University Press, 1951).

[12] Second Hoover Commission, *A Report to Congress, Water Resources and Power*, Vol. I, p. 3.

THE PROBLEM OF ECONOMIC EVALUATION

One of the most complicated and vexing illustrations of policy-administration confusion and conflict lies in the area of the economic evaluation of water resource projects. As it is often described, the purpose of such evaluation is to decide (1) whether or not a project should be undertaken; (2) whether the project under consideration should be developed in preference to some other project; and (3) a priority for the various projects that qualify under (1) and (2). The three main components of an economic evaluation of a project are a benefit-cost ratio, an allocation of costs, and a determination of a cost sharing formula. The benefit-cost ratio has been the subject of endless and largely fruitless study and dispute during the last 10 years. It involves the process of measuring the benefits of a project against its costs in terms of dollars to determine a ratio of benefits to costs. Normally the project will be recommended only where the ratio is at least 1:1, that is where benefits are at least equal to costs. Cost allocation is the process of assigning to each part of a multi-purpose project its fair share of the total costs of the project. This process is intimately linked to the final component, cost sharing, which involves a decision as to what cost division will be made between federal and non-federal interests.[15]

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[13] For an excellent summary of the various reorganization proposals see James W. Fesler, "National Water Resources Administration," *Law and Contemporary Problems*, Vol. 22 (1957), pp. 451-466.

[14] For a recent and unusually effective summary of the TVA experiment see Roscoe C. Martin, "The Tennessee Valley Authority: A Study of Federal Control," *Law and Contemporary Problems*, Vol. 22 (1957), pp. 351-377.

The whole question of the economic evaluation of water resource projects has become a sort of political football in which agencies go through an elaborate mathematical exercise to support the pre-conceived fact that they are best suited to develop the project in question. Thus agencies anxious to secure a larger number of projects are apt to seek to establish as high a benefit-cost ratio as possible. In a multi-purpose proposal, agencies are likely to assign a large percentage of the costs to non-reimbursable or self-liquidating elements of the comprehensive project in order to make the plan economically feasible and more attractive to local interests. Specifically, in the area of cost sharing, the lack of any clear-cut national policy has led to different federal agencies bargaining with local interests in terms of the most favorable cost sharing formula.[16]

The close link between cost allocation and cost sharing can be seen when it is recalled that the cost of certain functions in water resource development have traditionally been borne completely by the federal government, at least since the 1930's. Flood control, navigation, national benefits of fish and wildlife work, sediment control, and recreation (usually secondary), are included in this category. The cost of other functions has been financed either on a self-liquidating basis, or all or part of the work has been paid for by state or local interests. Thus the cost of public power is fully reimbursable out of the proceeds of power sales; local interests repay part of the cost of irrigation projects; and non-federal interests must assume all costs of municipal and industrial water supply.[17] It is not surprising, where rival federal agencies seek to carry out similar water resource functions in the same areas, that resultant disputes have often led to fancy economic gymnastics in order to present the local interests with as favorable a package as possible. In the cost sharing area, it is probably possible at present to find the greatest theoretical agreement as to what course future policy should take, since almost all recent studies agree that state and local interests should assume a larger share of the cost of water resource projects. The general theory in this area is that all local beneficiaries that can be identified should be expected to pay a part of the total costs of the project commensurate with the benefits they receive. Efforts to apply this theory in practice have met with only limited results. Federal agencies are still authorized, under conflicting policy, to apply different formulas to similar projects. In addition, the entire question has been considerably complicated during the Eisenhower Administration by its part in disputes over the "partnership" theory of natural resource development.[18]

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[15] Huffman, *Irrigation Development and Public Water Policy*, Chap. 12.

[16] U. S., House, Committee on Public Works, *Economic Evaluation of Federal Water Resource Projects*, House Committee Print 24, 82 Cong., 2 Sess., 1952, pp. 1-19.

THE PROBLEM OF INTERGOVERNMENTAL COOPERATION

One of the few generalizations that almost all those interested in water resource development support is that the problem of developing effectively the water resources of the United States is so vast, complex, and varied that each level of government has an important role to play. In spite of the existence of wide differences of opinion as to just what the division of authority and responsibility should be, there seems to be a general consensus, in theory at least, that in the past non-federal interests have not assumed as much of the overall burden as they could or should undertake.

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[17] Second Hoover Commission, *Task Force Report on Water Resources and Power,* Vol. I, pp. 42-45; The Tax Foundation, Inc., *Our Water Resources: The Need for a Unified National Policy* (New York: The Tax Foundation, Inc., 1953), p. 30.

[18] U. S., Senate, Committee on Interior and Insular Affairs and the Committee on Public Works, *Joint Hearings on S. Res. 281, Conservation and Development of Water Resources,* 84 Cong., 2 Sess., 1957; Roy E. Huffman, "Economic Implications of the Partnership Policy in Water Resources Development," *Journal of Farm Economics,* Vol. 38 (1956), 1275.

Historically, the record shows that state, local and private enterprise long bore the brunt of water resource development in the United States. In the field of irrigation, thousands of acres had been irrigated by non-federal interests before a national irrigation policy was established. In the field of drainage, state and local governments were long the sole public developers. Responsibility for flood control has moved from a predominantly local to a largely federal position. The recent practice of federal assumption of most of the financial burden in water resource development is a product largely of the Great Depression. Although the present trend is toward increasing somewhat the responsibilities of state and local governments, it seems unlikely that a booming population and a steadily more complex water problem will allow any significant diminution of federal responsibility for water resource development.[19]

One difficulty in increasing state-local responsibility in the water resource area has been the unwillingness of most states to carry out even modest administrative and policy reorganization plans in order to provide more effective machinery for dealing with the complex problems of water. Administrative dispersion in state organization for water resource development is still the rule. Many states have no organization at all which has the responsibility for coordinating the activities of the maze of state and local agencies concerned with water. Responsibility for water projects at the state-local level has often been concentrated in special districts rather than in any statewide organization.[20]

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[19] Elco L. Greenshields, "The Expansion of Irrigation in the West," *Water: The Yearbook of Agriculture*, 1955 (Washington: Government Printing Office, 1955), 247-251; Hugh H. Wooten and Lewis A. Jones, "The History of Our Drainage Enterprises," *Ibid.*, 478-490; Ernest A. Engelbert, "Federalism and Water Resource Development," *Law and Contemporary Problems*, Vol. 22 (1957), 325-350.

[20] Engelbert, "Federalism and Water Resources Development," 344-348.

The necessity of developing any major water project within the framework of a federal system further complicates the inadequacies of federal-state-local organization for dealing with the problem. An almost insuperable handicap in attempts to develop effective cooperative patterns which will allow full utilization of the nation's water resources grows out of the administrative dispersion problem at the local, state, and federal level. The pattern since the 1930's may be characterized as one in which a more or less uncoordinated cooperation between federal and state-local agencies within the various water problem areas has taken place, with the usual situation finding the federal government the dominant partner by virtue of supplying most or all of the money for any given project.[21]

EARLY STATE EFFORTS

First state efforts concerned with water resources development in central and lower Florida were largely concerned with securing some form of federal aid for the project. Florida's first post-statehood legislature, and one of its first United States Senators, James D. Westcott, Jr., made a number of attempts during the 1845-1850 period to secure a grant of federally owned lands in the area to the state. Westcott supported the inclusion of a condition that proceeds derived from the sale or other use of such land would be used solely for purposes of drainage. Disagreement with Florida's other Senator, David L. Yulee, blocked Westcott's effort, and Yulee's stand for an unconditional grant of the land was for all practical purposes fulfilled by the enactment of the Swamp Lands Act in 1850. This important statute granted to the states all federal land within their borders made unfit for cultivation by its swamp or overflowed status. The grant was made subject to a very specific proviso that "the proceeds of said lands . . . shall be applied, exclusively, as far as necessary, to the purposes of reclaiming said lands by means of levees and drains aforesaid."[22] After several unsuccessful experiments, Florida in 1855 created the Internal Improvement Fund, whose ex-officio governing board was composed of the governor, attorney general, commissioner of agriculture, treasurer, and comptroller. This agency was to administer the supposed trust created by the Swamp Lands Act, but the program of internal improvements prior to 1900, resulting in the alienation of all but 3,000,000 of the approximately 20,000,000 acres of land received by Florida under the grant, virtually ignored drainage, and concentrated on lavish grants of land to railroad and canal companies.[23]

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[21] The latest overall study of state administration of water resources is Council of State Governments, *State Administration of Water Resources* (Chicago: Council of State Governments, 1957).

The Internal Improvement Fund emerged from a state of post-Civil War confusion and financial insolvency in 1881 by negotiating a sale of 4,000,000 acres of land for $1,000,000. This transaction was made with Hamilton Disston, Philadelphia industrialist, and included a drainage contract that represented the most ambitious and comprehensive plan to drain and reclaim wet lands in central and southern Florida prior to 1947. The scheme envisaged the reclamation of some 9,000,000 acres of land in the Kissimmee, Caloosahatchee, and Lake Okeechobee areas, principally by lowering the level of the Lake and constructing channel improvements in the two rivers. The drainage company was to receive one-half of all lands successfully drained. In terms of actual accomplishment, the end result of this grand plan was extremely modest. Most of the work was done in the Kissimmee Valley area, and a channel was opened from the town of Kissimmee down the River to Lake Okeechobee, through the Lake via the Caloosahatchee River to Ft. Myers. In spite of company claims of millions of acres successfully drained, and the deeding by the Internal Improvement Fund to it of about 1,600,000 acres of land, only about 80,000 acres were actually reclaimed. Disston's contract with the Internal Improvement Fund ended in 1894, halting major drainage efforts in the area until the Jennings-Broward era.[24]

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[22] U. S., Senate, *Everglades of Florida: Acts, Reports, and other Papers, State and National Relating to the Everglades of the State of Florida and their Reclamation*, S. D. 89, 62 Cong., 1 Sess., 1911, pp. 35-44. Hereinafter cited as *Everglades of Florida, S. D. 89;* J. E. Dovell, "A History of the Everglades of Florida," (Unpublished doctoral dissertation, the University of North Carolina, 1947), p. 97; 9 *Stat.* 519.

[23] John M. De Grove, "The Administration of Internal Improvement Problems in Florida, 1845-1869" (Unpublished master's thesis, Emory University, 1953), pp. 47, 72-76, 120, 142. Chapters 2 and 3 contain a full discussion of the establishment of the Internal Improvement Fund and the enactment of the Swamp Lands Act.

The administration of Governor W. S. Jennings (1901-1905) and Napoleon Bonaparte Broward (1905-1909) marked the evolution and application of basic policies that allowed a full scale effort to drain and reclaim that section of Florida located generally south of Lake Okeechobee. While no actual construction work was started during the Jennings administration, the significance of his work in clearing the way for the future is difficult to overestimate. Jennings led a successful legal battle to prevent the remaining 3,000,000 acres of swamp and overflow land being deeded to railroad and land companies. In the course of this struggle the legality of using such land to carry out the original trust for which it was dedicated was clearly established. Jennings made the public land question an important political issue, and Broward subsequently based his campaign largely on a "save the public lands" battle cry.[25] In spite of obstructionist tactics by railroad, land, and canal companies, Broward won legislative approval in 1907 for a drainage district in the Everglades region, though only after the courts negated his 1905 success. This district was administered by a drainage board with the same ex-officio membership as the Internal Improvement Fund. The drainage effort was to be supported by a tax of five cents per acre on lands within the area to be drained. A basic amendment in 1913 definitely established a new agency, the Everglades Drainage District, with boundaries running from just north of Lake Okeechobee down the peninsula to the Florida straits. The Everglades Drainage District did not include the Kissimmee or St. Johns valleys, the lower east coast urban areas, or the western part of the Caloosahatchee valley. The basic drainage plan was to lower the level of Lake Okeechobee by an outlet canal, and to furnish additional drainage by a series of canals from the southern shores of Lake Okeechobee southeasterly through the Everglades to connect with the short lower east coast rivers.[26]

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[24] Alfred Jackson Hanna and Kathryn Abbey Hanna, *Lake Okeechobee: Wellspring of the Everglades*, The American Lakes Series, ed. Milo M. Quaife (New York: The Bobbs-Merrill Company, 1948), pp. 95, 122-124; *Everglades of Florida, S. D. 89*, pp. 21-24; Florida, *Minutes of the Proceedings of the Board of Trustees of the Internal Improvement Fund. . . .* (Tallahassee: I. B. Hilson, State Printer, 1904), Vol. 3, pp. 33, 163, 184, 190-195, 242-245; Dovell, "A History of the Everglades of Florida," pp. 135-138.

[25] "Message of the Governor," Florida, *House Journal* (1903), pp. 85-87; Dovell, "A History of the Everglades of Florida," pp. 195-202, 207-209.

From the beginning of the operation of the first dredge in New River during the Broward administration down to 1928 the basic system of canals and other works designed to drain the Everglades were installed. No further reclamation work of any significance was done until the beginning of construction in 1949 under the present comprehensive plan. However, the federal government, through the Corps of Engineers, did construct the present Lake Okeechobee levee system, and improved the waterway from Stuart to Ft. Myers via the St. Lucie Canal, Lake Okeechobee, and the Caloosahatchee River. The system of works constructed during the first three decades of the twentieth century remain today as an integral part of the water control plan for the area. By January 1, 1929, the Everglades Drainage District had spent almost $18,000,000; about $15,000,000 for canal excavation, some $2,000,000 for control works in the canals, almost $700,000 for levees, and some $360,000 for other purposes. The canals and levees represented a total excavation of about 79,000,000 cubic yards. The main works consisted of 440 miles of canals, including 5 main canals. The 24-mile St. Lucie was the main control canal for Lake Okeechobee, and it alone cost the Everglades Drainage District almost $6,000,000. The series of canals running southeast from the shores of Lake Okeechobee into the mouths of the various short east-west rivers were expected to give gravity drainage to the Everglades agricultural lands. The Hillsboro, 51 miles long, the North New River, 58 miles long, and the Miami, 85 miles long, were the principal canals in this category, and they emptied into the Atlantic Ocean at Deerfield Beach, Ft. Lauderdale, and Miami respectively. The 42-mile West Palm Beach Canal ran from the lower shore of Lake Okeechobee to the Atlantic just below West Palm Beach. The Caloosahatchee Canal work consisted of improving the old canals of the Disston project to provide limited navigation from Lake Okeechobee to the Gulf, and to give some drainage to the Caloosahatchee valley. The upper reaches of the West Palm Beach, Hillsboro, North New River, and Miami canals were connected by the Cross and Bolles canals, while the South New River Canal ran from the Miami Canal east to the Atlantic Ocean just below Ft. Lauderdale. The Cross Canal provided a 13-mile connection between the West Palm Beach and the Hillsboro canals; the Bolles Canal extended west from the Hillsboro across the North New River to a short distance west of the Miami Canal, a distance of about 20 miles. Canals of lesser importance were the Cypress Creek, Snake Creek, and Snapper Creek, emptying into the Atlantic Ocean at Pompano and north and south of Miami, respectively. In the northwest section of the Everglades Drainage District, the Indian Prairie Canal drained into Lake Okeechobee. Only one of these canals, the North New River, was ever excavated to its specified depths. This fact, added to the loss of capacity due to soil subsidence and the growing hyacinth menace, greatly reduced the efficiency of the system over the years.[27]

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[26] *Everglades of Florida, S. D. 89*, pp. 14, 27, 107; Dovell, "A History of the Everglades of Florida," pp. 212-213, 220-221, 224-225; Hanna and Hanna, *Lake Okeechobee*, p. 126; Florida, *Acts and Resolutions* (1913), p. 129.

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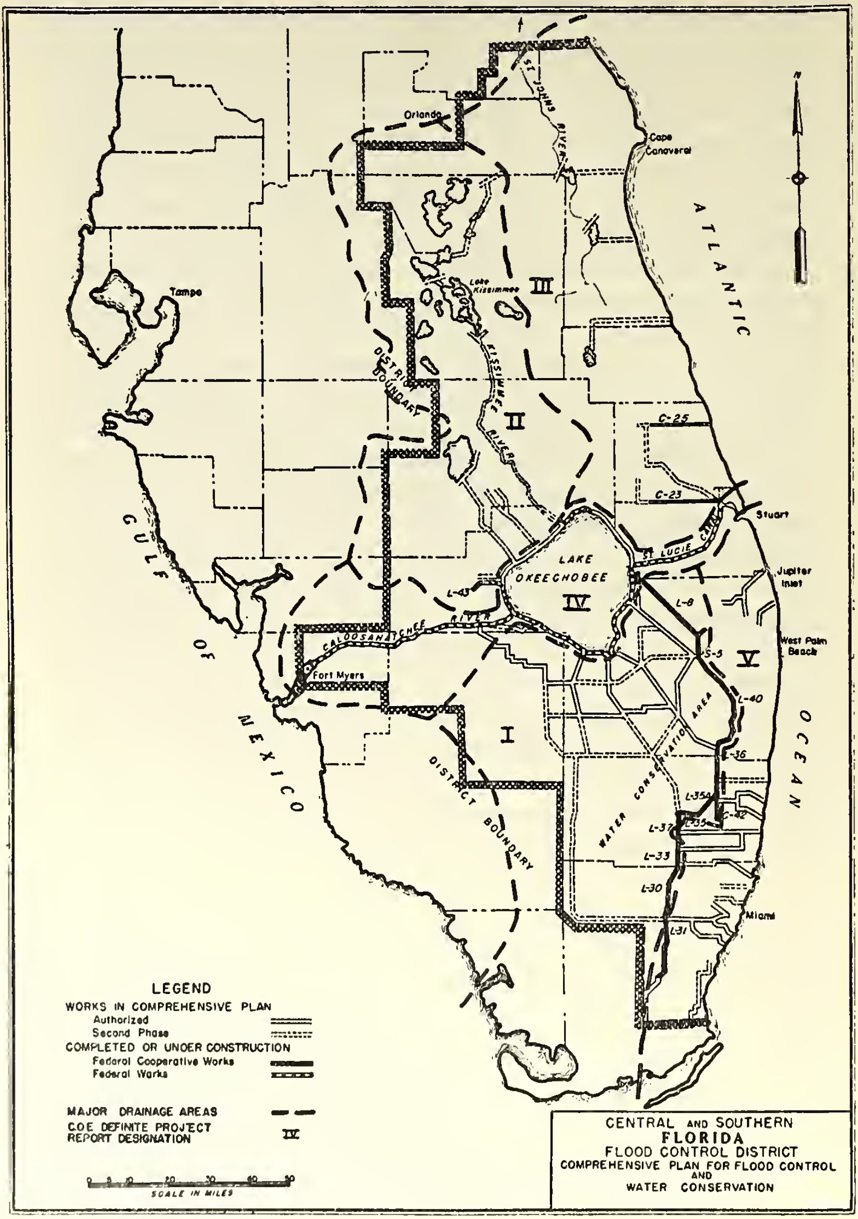
[27] Florida, Everglades Drainage District, *Biennial Report, 1927-1928 to the Board of Commissioners*, prepared by Chief Drainage Engineer Fred C. Elliot, pp. 19, 63-66, hereinafter cited as *EDD Biennial Report, 1927-1928* (copy in the P. K. Yonge Library of Florida History, University of Florida); Anston Marston, S. H. McCrory, and George B. Hills, *Report of Everglades Engineering Board of Review to Board of Commissioners of Everglades Drainage District* (Tallahassee, Fla.; T. J. Appleyard, Inc., May, 1927), pp. 24-36, hereinafter cited as *Engineering Board of Review, 1927;* Florida, Agricultural Experiment Station Bulletin No. 442, *Soil, Geology, and Water Control in the Everglades Region, March, 1948.* University of Florida Agricultural Experiment Station in Cooperation with United States Department of Agriculture, Soil Conservation Service, prepared under the direction of Lewis Jones, Chief, Division of Drainage and Water Control, Soil Conservation Service, pp. 84-95. Hereinafter cited *Soil, Geology, and Water Control in the Everglades, Bulletin 442.*


Orlando
ST JOHNS RIVER
Cape Canaveral
ATLANTIC
OCEAN
Tampa
Lake Kissimmee
III
KISSIMMEE RIVER
II
DISTRICT BOUNDARY
GULF OF MEXICO
C-25
C-23
Stuart
ST LUCIE CANAL
LAKE OKEECHOBEE
IV
L-43
Jupiter Inlet
L-8
CALOOSAHATCHEE RIVER
West Palm Beach
S-5
V
Fort Myers
L-40
I
WATER CONSERVATION AREA
L-36
L-35A
C-42
L-37
L-35
L-33
L-30
Miami
L-31
LEGEND
WORKS IN COMPREHENSIVE PLAN
Authorized
Second Phase
COMPLETED OR UNDER CONSTRUCTION
Federal Cooperative Works
Federal Works
MAJOR DRAINAGE AREAS
C.O.E. DEFINITE PROJECT REPORT DESIGNATION
IV
0 5 10 20 30 40 50
SCALE IN MILES
CENTRAL AND SOUTHERN
FLORIDA
FLOOD CONTROL DISTRICT
COMPREHENSIVE PLAN FOR FLOOD CONTROL
AND
WATER CONSERVATION

MAP No. 2

THE PERIOD FROM 1905-1931

ADMINISTRATIVE PROBLEMS OF THE EVERGLADES DRAINAGE PROJECT: 1905-1931

Water control efforts in central and southern Florida during the 1905-1931 period were hampered by two major administrative problems. The first problem concerned a characteristic peculiarity of Florida government—the excessive use of the ex-officio board. The second problem arose over the division of responsibility among a number of agencies that has been a common pattern in resource development in the United States. The question of the division of responsibility assumed two aspects; first, the question of responsibility for the primary system of water control works to be constructed by state agencies; and second, the responsibility for secondary and on-the-farm drainage works.

Heated disputes arose time and again during the period 1905-1931 over the difficulties inherent in relying on an ex-officio board for carrying out the day-to-day administration of the project, with board members often living 500 miles from the area of the work. The board problem, in turn, was closely linked with the question of developing a satisfactory system of administrative management for the project. At no time during this period did any of the agency boards involved elect to restrict themselves to matters of policy and select a general manager to administer the routine affairs of the project. During the Broward administration the Governor himself took over executive management, due to his intense interest in the problem. After that the weaknesses inherent in such an administrative device became increasingly obvious.

Another aspect of the problem of boards as administrative units soon became part of a bitter political quarrel between north and south Florida. This dispute came to a head during the administration of Governor John W. Martin (1925-1929), in the form of opposition to a Martin-sponsored plan to enlarge the project by floating a $20,000,000 bond issue. Anti-Martin forces demanded "home-rule" by a locally-elected board that would be required to have its headquarters in, and be composed of, people from the area of the project. Martin bitterly opposed this move, but it was finally adopted in 1931 during the administration of Doyle Carlton. The governor, however, did retain the power of appointing the five-man board, with the requirement that they all be residents of the Everglades Drainage District, and that no two should come from the same county.[28]

The use of boards to administer water resource programs in central and southern Florida raises a number of questions. Well before 1930 students of public administration were generally agreed that the excessive reliance on the board system did not generally produce satisfactory results. The alternative suggested was usually a single administrator directly responsible either to a strictly policy-making board, or to the governor. The Florida project had not only clung to the board device, but had gone further, since the boards of all three agencies most vitally concerned in the project were identical ex-officio absentee bodies. With such an administrative handicap it is not surprising that the desire, responsibility, and power to carry out a plan that would utilize to the fullest the soil and water resources of the area was never forthcoming during the 1905-1931 period.

The proper locus of the responsibility for developing a master plan for both the primary and the secondary-on-the-farm works necessary for a complete water control plan in south-central Florida has never been satisfactorily fixed. From the beginning, the plan of development in the Everglades assumed that responsibility for secondary and on-the-farm works rested on sub-drainage districts and individual farmers, while the primary system was the responsibility of a special district, the Everglades Drainage District. This agency, however, did not take definite form as a separate unit of government with the usual powers of a public authority until 1913. Up to that time the work of developing the primary project was in fact the responsibility of the Internal Improvement Fund. After 1913, the Everglades Drainage District was the principal agency concerned, but the Fund continued to play an important, although rather uncertain, role in the project. The relationship between the agencies was complicated by the fact that the same ex-officio board members directed them both. In 1929, a third agency, the Okeechobee Flood Control District, was added to assume responsibility for ending the Lake Okeechobee flood menace. No one of the three agencies involved ever had both the authority and responsibility to devise, finance, and carry to completion a plan that would have assured the wisest use of the resource base in the area. In view of this failure to concentrate power in one agency able to do the job, the problem of adequately coordinating and supervising (or perhaps even assuming partial or total responsibility for) the work of sub-drainage districts and individual farmers to see that their share of the overall program was carried out was also never resolved.[29]

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[28] John W. Martin, *Address of John W. Martin, Governor of Florida, on the Everglades and the Drainage Problem,* West Palm Beach, Oct. 28, 1926, pp. 23-24, 27; John W. Martin, *Financing Everglades Drainage,* discussion before Miami Chamber of Commerce, January 10, 1927, pp. 8-9; Dayton Morgan Engineering Company, *Report to the Board of Supervisors of Dade Drainage District on Reclamation of the Everglades,* Dayton, Ohio, Oct. 1927, pp. 3-5, 9-21, hereinafter cited as *Morgan Report, 1927* (All three pamphlets in the P. K. Yonge Libray of Florida History); *Engineering Board of Review, 1927,* pp. 23-25; *EDD Biennial Report, 1927-1928,* pp. 5-6; *Everglades News* (Canal Point, Florida), May 8, 1925, July 3, 1925, February 17, 1928; J. E. Dovell, "A Brief History of the Florida Everglades," *The Soil Science Society of Florida, Proceedings,* Vol. 4-A (1942), 158; Florida, *Acts and Resolutions* (1929), pp. 146-155 and *Ibid.* (1931), pp. 195-205, 236, 246; U. S., Senate, *Caloosahatchee River and Lake Okeechobee Drainage Areas, Florida: A Report to the United States District Engineer, Jacksonville Florida; Submitted by Okeechobee Flood Control District of Florida, December 3, 1930, S. D.* 225, 71 Cong., 3 Sess., 1930, pp. 4-15.

It can be argued that the crucial weakness lay not in the board system, but in the way in which the boards used their power. Board members of the Drainage District and the Fund were the same until 1929. Had an effective, highly decentralized organizational structure been devised, with a single top administrative officer located in the area of the project, the results might have been quite different. In such circumstances the leadership needed for viewing the problem realistically might not have been missing. However this may be, the conclusion of a 1930 study regarding the administrative effectiveness of the agencies created to carry out the project is pertinent:

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[29] Florida, *Acts and Resolutions* (1905), pp. 22-23; *Ibid.* (1907), pp. 220-222; *Ibid.* (1913), pp. 125-126, 129-132, 175, 184, and *passim; Ibid.* (1929), pp. 146-155; *Engineering Board of Review, 1927*, p. 28; *Minutes of the Board, Internal Improvement Fund*, Vol. 9 (1913), pp. 504-505, 578-579.

> As regards EXECUTIVE MANAGEMENT, there seems never to have been very much. Apparently, THE BOARDS constituted by law to administer the affairs of the DISTRICT have, with few exceptions, either not realized the vastness of their task and the necessity of selecting a GENERAL MANAGER to direct the work for them, or they have, in the complicated nature of their PRIMARY duties for the discharge of which the electorate of the State selected them, been fearful of the responsibility which they would shoulder if, realizing the vastness of the problem, they did select a General Manager. Whether either or both of the above or others are the real reasons, the fact remains that there is not NOW nor has there ever been, as far as we can discover, any real EXECUTIVE MANAGEMENT of the affairs of the DISTRICT. Neither this undertaking nor any other can be aught but a failure under such conditions.[30]

While this is a harsh analysis, it seems to reflect the facts of the situation.

ECONOMIC PROBLEMS OF THE EVERGLADES DRAINAGE PROJECT, 1905-1931

Since the state of Florida never gave direct financial aid to the Everglades drainage project until 1949, it was necessary from the very first to look to the land in the District as the source of funds to finance this work. During the 1905-1931 period, efforts to raise money included the sale of the swamp and overflow land held by the Internal Improvement Fund; the levying of acreage and ad valorem taxes on the land within the Everglades Drainage District; and the issuing of District bonds. In the end none of these methods proved adequate to the task, and the Everglades Drainage District lapsed into financial insolvency in 1931.

The first levy upheld by the state courts was a straight five cents per acre tax on all lands within the Drainage

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[30] D. Graham Copeland, *Policy: A Report to the Board of Commissioners of the Everglades Drainage District* (Ft. Myers, Florida: Ft. Myers Press, 1930), pamphlet in the P. K. Yonge Library of Florida History, p. 2. See also Clarence R. Bitting, "Report on the Everglades and Contiguous Areas," Clewiston, Florida, February 26, 1943, p. 26. (Mimeographed copy in the library of the Central and Southern Florida Flood Control District, West Palm Beach, Florida.)

District boundaries. The first actual funds available for the project, however, came from the sale of lands by the Internal Improvement Fund, since the acreage tax was blocked by court suits until 1910. Land sales proved to be an uncertain source of revenue, since the prices and availability of buyers varied widely from time to time. While the secular trend of prices per acre was sharply upward, moving from about $5.00 to $100 per acre during the period, this source of revenue did not prove adequate. There were two other fundamental disadvantages to relying on the sale of land for money with which to further the project. First, it forced the state to sell potentially valuable land before it reflected the economic rise that would come with drainage, in order to carry out the very drainage in question. Second, it encouraged the indiscriminate sale of lands over the entire area, thus making a rational drainage plan almost impossible.[31]

From 1910 to 1917, agencies developing the project relied on land sales and the acreage tax for funds. The latter brought in $197,000 in 1907, the first year it was collected, and gradually increased its yield to a high of $1,247,000 in 1927. After 1913, the Internal Improvement Fund had to pay taxes on the land it held within the Everglades Drainage District and, lacking any other source of revenue to meet this obligation, the Fund had to fall back on selling more land, thus further aggravating the premature land sales problem. The zoned acreage tax was also introduced in 1913, and this system was kept until the new program was adopted in 1949. The first zone rates, supposedly determined according to anticipated benefits from the work, ranged from 5 to 25 cents per acre. The rate was revised upward until in 1925 it ranged from 3 cents to $1.50 per acre. After 1917 funds for the project were derived almost solely from the sale of bonds, to be retired by the revenue from the acreage taxes. More than half of the $18,000,000 spent during the period 1905-1931 came from this source. The ad valorem tax over the same time span raised only small sums.[32]

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[31] *Engineering Board of Review, 1927*, p. 28; Dovell, "A History of the Everglades of Florida," pp. 230-232; *Everglades of Florida, S. D. 89*, p. 120; F. C. Elliot, *The Everglades*, Supplement to *Florida Quarterly Bulletin* of the State Agriculture Department, January 1, 1921, p. 5; F. C. Elliot, *Draining the Everglades*, reprinted from a series of three articles appearing in the *Florida Magazine*, beginning with the June 1924 issue, pp. 11-12; Dovell, "A Brief History of the Florida Everglades," 143-145; *EDD Biennial Report, 1927-1928*, pp. 66, 76-77.

The most persistent and difficult financial problem confronting the Everglades drainage project has been to determine the proper sources from which to draw funds for the program. The dispute has centered mainly around the benefit assessment method of raising funds versus the ad valorem method, and has pitted the agricultural and ranching groups in the areas against the urban elements. When it became apparent in the mid-1920's that new funds would have to be found if the project was to be continued, a Governor John W. Martin proposal for a $20,000,000 bond issue to meet the need touched off a bitter fight between urban coastal interests and the farm-ranch group. The urban group feared that the "emergency" ad valorem tax allowed under the bond issue would put the main cost burden upon the urban areas, while the rural areas would receive most of the benefit. Although the urban group won a victory when the courts rejected the Martin bond plan, bankruptcy and the subsequent halting of work on the project delayed any final settlement of the issue.[33]

Another element in the urban-rural difference over the way to finance the program involved the boundaries of the Everglades Drainage District. The fact that the most populous and wealthy section of the area, the rapidly growing lower east coast region, was not included within the District boundaries was a key factor adding to the difficulties of the Drainage District in marketing additional bonds during the

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[32] *EDD Biennial Report, 1927-1928,* p. 68, 133, 160-170; R. K. Lewis, "Reclamation and Soil Conservation Problems of the Florida Everglades, the Economic Phase," *The Soil Science Society of Florida, Proceedings,* Vol. 4-A (1942), 100.

[33] For the anti-bond issue point of view see *The Taxpayer's Answer to Governor Martin: An Analysis of the $20,000,000 Bond Issue: Dade County's Position: The State Obligation* (pamphlet in P. K. Yonge Library of Florida History); *Morgan Report, 1927,* pp. 3-4. For the pro-bond issue viewpoint, see *Conference on Florida Everglades, Baltimore,* 1927, especially pp. 49-62, 65-76. Other pertinent sources on this subject are Dovell, "A History of the Everglades of Florida," pp. 443-458 and *EDD Biennial Report, 1927-1928,* p. 75.

1920's. Officials of the District tried without success to win approval in the legislature for the inclusion of this area.[34]

An analysis of the economic policies of the agencies responsible for the Everglades drainage project from 1905 to 1931 reveals fully as many weaknesses as did the analysis of the administrative policies. The failure to follow a benefit-based tax principle generally approved for such projects resulted in the first instance from a lack of any comprehensive, realistic plan for reclaiming the area. Since an accurate benefit-cost analysis must be based on a complete plan that will be carried out, this approach was blocked. As a substitute, a tax structure was devised that often resulted in the taxation of land for which the project was not likely to produce any benefits in the foreseeable future. A further fundamental weakness in the plan was the gross underestimation of the final cost of the project that characterized it from the very beginning. Arthur E. Morgan, later a board member of the Tennessee Valley Authority, delivered a scathing attack on the project's economic policies in a report in 1927 in which he objected to the acreage tax, even the zoned approach, as not in accord with benefits accrued from the project, but rather conforming to "an inequitable, antiquated system, arbitrarily fixed by the legislature." Morgan contended that this method of financing large drainage and reclamation projects had been widely rejected in favor of assessment of benefits according to a "definitely adopted plan, and with provisions for hearings in case of question as to the rightness of the assessment." Morgan rejected the ad valorem tax as also failing to fulfill the formula of taxation according to benefit.[35]

Whether his recommendations were in fact sound may be questioned, but certainly it is true that a rational economic program and policies for the project could not be adopted in the absence of an adequate plan. An adequate plan, in turn, awaited both the gathering and analysis of sufficient basic data, and the development of a broader concept of what an overall water control program involved.

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[34] U.S., Senate, *Report of the Florida Everglades Engineering Commission to the Board of Commissioners of the Everglades Drainage District and the Trustees of the Internal Improvement Fund,* S.D. 379, 63 Cong., 2 Sess., 1913, p. 57 (hereinafter cited as *Randolph Report, 1913*); Florida, *Everglades Drainage District, Biennial Report, 1925-1926, to the Board of Commissioners* (prepared by Chief Drainage Engineer Fred C. Elliot), pp. 46-50 (hereinafter cited as *EDD Biennial Report, 1926-1927*).

[35] *Morgan Report, 1927,* pp. 5-6.

SELECTED PHYSICAL PROBLEMS OF THE EVERGLADES DRAINAGE PROJECT, 1905-1931

The Drainage, Reclamation, and Flood Control Plan. It is a fundamental prerequisite that any adequate water control plan be preceeded by a careful gathering and analysis of basic hydrological and agronomic data. This prerequisite was not met by any state or federal government agency during this period, with the result that no adequate plan could be devised. Most, if not all, of the several engineering studies of the project dating from the Wright Report in 1909 to the Engineering Board of Review in 1927 were inspired more by the desire of the governor and his cabinet to defend their Everglades policy than to insure the gathering of adequate data. Lack of the needed data on which to base a rational plan, in turn, caused the project to suffer because of a gross underestimation of the complexity of the water control problem.

From Napoleon Bonaparte Broward's "cut and try" approach in 1906 right through to the end of construction efforts in 1928, the main concentration of effort was on the single purpose of draining the land so that it could be farmed. Little or no attention was given to the many other aspects of the water problem, or even to whether or not the land would be fit for farming after it was drained. Engineering reports such as the Randolph Report in 1913, two reports by Drainage District Chief Engineer Fred C. Elliot in 1927 and 1929, and the report of the Everglades Engineering Board of Review in 1927, all concentrated their attention on the drainage problem. While the latter reports were in agreement that shorter east-west canals should be substituted for the long diagonal canals, none constituted an overall look at the water problems of the area. Passing reference was made to some of the problems connected with drainage, such as soil subsidence, but nothing like a multipurpose approach emerged. The single added element clearly reflected in the Elliot reports and in the Engineering Board of Review work was the consideration of the question of how to control the flood dangers of Lake Okeechobee. This acute problem was unmistakably emphasized by the hurricanes of 1926 and 1928 in which 2,000 to 3,000 persons were drowned when hurricane winds blew the water out of the Lake and over the towns along its southern and western shores. From the point of view of long-range planning, the highlight of these research efforts was perhaps the Randolph Report's emphasis on the need for a program of long-range data collection and analysis as an absolute necessity before any satisfactory plan could be formulated. Unfortunately, this aspect of the study received little or no attention at the time, and was not acted upon.[36]

Progressive Drainage and Soil Subsidence. The idea of progressive drainage—that is draining the Everglades in small sections only as there was a demand and need for the land—is almost as old as the Everglades drainage project itself. The problem of soil subsidence also was noted at an early date, but the close link between the two was not fully recognized for a long time. The link is that subsidence control cannot be effected unless the progressive drainage principle is followed in the exploitation of the peat soils of the Everglades. Haphazard and uncoordinated drainage all over the area without benefit of a central plan inevitably results in the partial drainage of large sections of the land long before they are used. These areas then start to subside just as rapidly as land being used, and in fact such waste has been characteristic of Everglades development from the beginning. The Randolph Report, both of Chief Engineer Elliot's reports, and the Everglades Engineering Board of Review report, all approved progressive drainage in the abstract, and Elliot made a strong plea for the adoption of such a policy in his 1927 report. None of these investigations, however, faced the fact that a basic change in policy would have to preceed the adoption of progressive drainage. Such a change would have had to include the adoption of a master water plan for the region, and the abandonment of the laissez faire approach to land disposal used from the beginning by the Internal Improvement Fund. In lieu of this the situation called for a unit development plan that would have necessitated sharp restrictions on property rights in the interest of the public welfare of the entire area. While Drainage District Engineer Elliot and the various engineering reports favored progressive drainage as an idea, there was little support for such a program and the legislation it would involve, either from Drainage District Commissioners or the farmers in the Everglades.[37]

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[36] J. C. Gifford, *The Everglades and other Essays Relating to Southern Florida* (Kansas City: Everglades Land Sales Co., 1911), pp. 98-99, as quoted in J. E. Dovell, "A Brief History of the Florida Everglades," 143; *Randolph Report, 1913*, pp. 5, 8, 12-16, 35, 39, 41-43; *EDD Biennial Report, 1925-1926*, pp. 11, 14-19, 22-27, 33, 66, 75; *Engineering Board of Review, 1927*, pp. 7-9, 12-18; *EDD Biennial Report, 1927-1928*, pp. 22-31, 46-47.

Engineering studies of the soil subsidence problem during the period 1905-1931 recognized but grossly underestimated the situation. In a study for the United States Department of Agriculture in 1907-1909, J. O. Wright noted the extreme susceptibility of muck and peat lands to drought, stressed the fire hazard, and estimated that after drainage peat soil would settle to one-half its depth from the existing surface to the permanent water table. The Randolph Report in 1913 held that the subsidence danger was being overemphasized, and predicted that shrinkage would total only 7.8 inches. The 1927 Engineering Board of Review report contained the fullest and most realistic discussion of the subsidence problem to that date. The Board first noted that a maximum subsidence of 8 feet from an original depth of 18 feet over a period of 87 years had been recorded on the fens of England. The Board of Review then predicted a future subsidence of three feet below the ground surfaces where the muck and peat was more than six feet deep, and less than three feet where it was less than six feet deep. This was in addition to the 1.5 to 4.6 feet of subsidence that had already taken place, the latter having been observed on a Moore Haven plot established in 1912. The Board of Review recommended that undeveloped land be isolated from the rest of the area by levees so that water could be held on it to stop the destruction of the soil.[38]

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[37] *Randolph Report, 1913*, pp. 7-8, 12-13. This Report was actually quite unclear in its recommendations as to progressive drainage; in one place the report appears not only to endorse the idea but to hold that the EDD Board was pursuing this policy, yet in another place it holds that while the progressive drainage system was preferable, "the existing works and the conditions of land ownership and settlement seems . . . to necessitate" draining all the area except the southwest Everglades (see p. 12). Also pertinent are *EDD Biennial Report, 1925-1926*, pp. 45, 51, 59-61 and *Engineering Board of Review, 1927*, pp. 19-20.

The Secondary System of Drainage Works. From the beginning of the Everglades drainage project the Internal Improvement Fund-Everglades Drainage District board intended to sponsor only the construction of main drainage canals in the Everglades. Failure to comprehend the difficulty of draining the area lead many of the early members of these boards to believe that little or no further effort would be required to effect the complete reclamation of the area. As it became increasingly obvious that a great deal of additional effort would be needed to bring about any kind of complete drainage, sub-drainage district legislation was adopted.[39]

Starting with the Lake Worth Drainage District in 1915, at least eight other sub-drainage districts were formed and either were or had been active by 1931. They contained a total of 542,000 acres of land, and had spent a total of almost $6,000,000 by 1928. At that date, however, many of the sub-districts were already in financial difficulties, and only about 30,000 of their acres were actually under cultivation. The Lake Worth Drainage District alone spent $3,000,000 and built 100 miles of main canals and 400 miles of lateral ditches, but had only 5,000 acres actually under cultivation in 1928. With the development of the sub-drainage districts, it became increasingly obvious that the existing laws designed to integrate their works into the main drainage system built by the Everglades Drainage District were inadequate. Sub-drainage district supervisors and engineers complained that the failure to set down an overall drainage and reclamation control plan made it impossible to develop the land to its fullest productivity. The policy of allowing individual landowners to develop large tracts outside any sub-drainage district, or of allowing such districts to develop tracts far removed from the main center of development, caused conflict and confusion. The situation became so chaotic that the whole system was threatened with general breakdown.[40] This situation was simply another aspect of the general failure to collect needed data, and then to devise a really comprehensive reclamation plan supported by adequate legislation which would include an abandonment of the extreme individualism that had handicapped the project from the beginning.

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[38] *Everglades of Florida, S.D. 89*, pp. 177-179; *Randolph Report, 1913*, pp. 62-63; *Engineering Board of Review, 1927*, pp. 73-80.

[39] For the various types of sub-drainage district legislation adopted see Florida, *Acts and Resolutions* (1913), pp. 184 and *passim; Ibid.* (1929), pp. 151-155; and *Ibid.* (1931), pp. 236-246.

The period 1905-1931, then, featured an intense but single purpose effort to solve the water problems of central and southern Florida. The concentration on drainage, together with basic administrative and economic weaknesses, sharply limited the effectiveness of the work that was done. While considerable progress was made in draining and bringing into use the potentially rich muck and peat soils of the Everglades, the rate of development was far below what had been anticipated.[41] When work on the project stopped in 1928 with the job far from complete, none of the fundamental economic, administrative, or physical problems that had hampered progress to that time had been resolved. The task of re-thinking every phase of the problem during the next two decades was left for new leaders with a better concept of the complexity of the situation.

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[40] U.S., House, *Caloosahatchee River and Lake Okeechobee Drainage Areas, Florida*, H.D. 215, 70 Cong., 1 Sess., pp. 37-38; H. A. Bestor, "Reclamation Problems of Sub-Drainage Districts Adjacent to Lake Okeechobee," *The Soil Science Society of Florida, Proceedings*, Vol. 5-A (1943), 157-159, 162-163.

[41] See below, pp. 34-35.

THE EVOLUTION OF THE MULTI-PURPOSE APPROACH, 1931-1947

After the financial collapse of the Everglades Drainage District in 1928, no significant additions were made to the drainage system until work started under a new program in 1949. Even basic maintenance was neglected, and the system became progressively less efficient as the Drainage District struggled to extract itself from a tangled financial web. In spite of this dark picture, the period from 1931 to 1947 was of utmost significance to the Everglades project. It was during this period that the sentiment for developing a complete water control program to replace the old haphazard drainage efforts became strong enough to reflect itself through new organizations and new comprehensive programs to gather data. Men who had pleaded in vain for listeners as they warned of the sure and swift disaster that would come if a new approach were not adopted now found willing listeners, as the depression decade produced a general atmosphere favorable to change. Names such as R. V. Allison of the Everglades Experiment Station, W. Turner Wallis and Lamar Johnson, both prominent engineers long identified with the drainage project, John C. Stevens of the Soil Conservation Service, and Gerald G. Parker and Nevin D. Hoy of the United States Geological Survey, began to be much discussed in the Everglades as public interest in facing the many-sided water control problem increased. In 1939, the Soil Science Society of Florida was organized with R. V. Allison as Secretary-Treasurer. This organization, through its publication and through a series of special meetings, assumed the leadership in the campaign to win support for a comprehensive water control program and the vast job of data collection and analysis that had to precede the final evolution of any such plan. The Society served as the common meeting ground between the specialists studying the problems and the farmers and businessmen of the area.

An analysis of articles in the *Soil Science Society Proceedings* written by Allison, H. A. Bestor, and Ralph Blank, a report to Florida's governor by Clarence R. Bitting, and many other such publications, reveals the development of new basic concepts regarding the water control problem in central and southern Florida. These concepts can be summarized as follows: (a) the reckless drainage practices of the past had resulted in the needless destruction of soil, wildlife, and vegetation, yet had not provided an effective drainage system; (b) the water problem was not simply a matter of drainage and flood control, but involved almost every element of water resource development, the principal ones being irrigation, municipal and industrial water supply, salt water intrusion control, fish and wildlife protection, and the provision of recreation facilities; (c) the great need was to reconstitute the natural balance between land and water that had existed before drainage began, and that the way to do this was by setting aside large areas in the Everglades unfit for long range agriculture and re-watering it; (d) this re-watering process would help solve almost every phase of the water problem, and most especially would halt the needless destruction of large areas of drained but unused land; (e) the key to the future prosperity of the area lay in the immediate launching of a long-range program for the gathering of data that would allow the formulation of a comprehensive water control plan; (f) it was essential to undertake an administrative reorganization that would centralize authority and responsibility for this new plan in one agency; and that (g) the new plan must be supported by adequate legislation limiting the extreme individualism that in times past had prevented the development of the area in the best interests of the public.[42]

Financially, the story of the Everglades Drainage District from 1931 to 1947 consisted of a long and frustrating struggle to regain solvency. Bitter conflicts with bondholders and unsuccessful efforts to compromise the debt and refinance the Drainage District were finally ended under the aggressive leadership of Governor Spessard L. Holland. In 1941 the $17,000,000 debt of the Drainage District was scaled down to $5,660,000 and refinanced through a Reconstruction Finance Corporation loan. A new tax schedule and lenient procedures for redeeming tax-delinquent land in the District were also approved by the legislature. A new acreage and ad valorem tax provided enough money to retire the debt, but very little was left for maintenance and operation.[43]

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[42] Illustrative articles from various issues of *The Soil Science Society of Florida, Proceedings* are: R. V. Allison, "The Soil and Water Conservation Problem in the Everglades," Vol. I (1939), 35-37; H. A. Bestor, "The Principal Elements of a Long Time Soil and Water Conservation Plan for the Everglades," Vol. 4-A (1942), 90-99; R. V. Allison, "The Need of the Everglades for a Specific Plan of Development Based on the Physical and Chemical Characteristics of its Soils and a Rational Handling of its Water Supply," Vol. 5-A (1943), 126-132; Ralph Blank, "An Outline of Needed Legislation for Local and State-Wide Water Conservation and Control," Vol. 8 (1946), 115-118. See also Bitting, "Report on the Everglades and Contiguous Areas," pp. 17-21.

In spite of its continued financial handicap, the Drainage District took one of the most significant steps in the history of the Everglades when it designated three water conservation areas totalling over 500,000 acres to serve as the heart of the re-watering process. Coming in 1945, this was the first move toward putting into effect the new approach to the water problem of the area. This action was the outstanding example of District Chief Engineer Lamar Johnson's statement that "the Board of Commissioners of Everglades Drainage District is finding ways to do constructive work with very little money. They are actively laying the ground work that will facilitate the execution of a beneficial program when funds are available from whatever source."[44]

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[43] The following articles from *The Soil Science Society of Florida, Proceedings*, trace the financial developments: R. K. Lewis, "The Economic Phase: Introduction," Vol. 4-A (1942), 100-103; J. E. Beardsley, "Present Status of Plans for Refinancing the Everglades Drainage District," Vol. 4-A (1942), 104-112; J. E. Beardsley, "Everglades Drainage District," Vol. 5-A (1943), 166-169.

[44] Lamar Johnson, "Progress of the Unit Plan of Reclamation in the Everglades," *The Soil Science Society of Florida, Proceedings*, Vol. 8 (1946), 94-96 and Lamar Johnson, "A Brief Review of the Water Control Program as it was Developed During the Past Six Years," *Ibid.*, Vol. 9 (1948-49), 116-118.

ECONOMIC PROGRESS UNDER STATE-LOCAL DEVELOPMENT, 1905-1947

Nothing approaching the hopes of early Everglades developers that millions of acres would be quickly brought under cultivation through small farms actually took place during the 1905-1947 period. Agricultural development, the predominant economic base of the region, was slow and painful. No crop production on a commercial scale occurred before 1915, and progress was slow to 1928 as production expanded to 96,000 acres. At this time sugar cane (11,000 to 15,000 acres) and vegetable crops (11,000 acres) were the most important crops, with cattle and peanuts of considerable importance. These figures, however, were apparently compiled by adding together all lands that had been cultivated at any time during the period. Probably no more than half this amount was ever under cultivation at the same time, and after the collapse of the 1926 boom the percentage of the 96,000 acre estimate actually under cultivation declined even further.[45]

The 1931-1947 period marked the first sustained agricultural development in the Everglades, mainly through sub-drainage districts. The federal government's flood control project that created new confidence in the future of the area, low lake levels, an absence of major storms, and the extensive introduction of pumping, made possible a development that belied the weak financial position of the Drainage District. By 1943 some 100,000 acres of land was in use for vegetables and other crops, in addition to some 30,000 acres of sugar cane. Here again, however, not all of the land was utilized year after year on a sustained basis. Thus much of the farming was done by speculative land tenants who paid little attention to the possibilities of efficient year-round use of the land, or to conservation practices that would have extended the life of the organic soil. While the bulk of the agricultural development took place in an arc around the southern shores of Lake Okeechobee, a considerable amount of land was developed in scattered areas over the Everglades, often by individuals rather than sub-drainage districts. As a result, a systematic and efficient use of the drainage facilities became almost impossible, and a system had developed involving "the haphazard formation of sub-drainage district areas, the indiscriminate development of individual areas, and the promiscuous diking and ditching of small tracts," that wasted the land and prevented effective water control. By 1944, a total of 152,975 acres of crop land was harvested in nine counties lying wholly or partly within the Everglades region, valued at $31,229,315. Palm Beach County, which included most of the muck and peat soils, led with a total of almost 73,000 acres, and a crop valuation of about $14,000,000. Truck crops were led by snap beans and celery, with cabbages, tomatoes, and many others also important. The use of land for improved pasture was beginning to be important, and experiments were being made in growing fiber crops, mainly ramie.[46]

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[45] *EDD Biennial Report, 1927-1928*, pp. 66-70; E. R. Lloyd, *Agricultural Possibilities of the Florida Everglades*, S.D. 85, 71 Cong., 2 Sess., (1931), pp. 13-16.

A major factor in the extremely slow development to 1928 was the discovery that the rich looking raw peat soil would not grow most crops successfully without extensive treatment. Research by the Everglades Agricultural Experiment Station, established in 1921, resulted in the discovery that this condition was due to basic trace element soil deficiencies, principally copper sulphate. This discovery ranks as one of the most important events in the history of the Everglades, and was a major factor in the agriculture development that took place between its announcement in 1926 and 1947.[47]

Early hopes that the land use pattern in the area would be in small farms were abandoned during the early days of the project. Some of the first holdings included areas of 70,000 acres (the Brown Company), 130,000 acres (the Southern Sugar Company), and 212,000 acres (the Pennsylvania Sugar Company). While these giant tracts were not typical, acreages of a half-section or more probably were.

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[46] H. A. Bestor, "Principal Elements, Soil and Water Conservation Plan for the Everglades," 92-98; *Soil, Geology, and Water Control in the Everglades, Bulletin 442*, pp. 18-20.

[47] Interview with Dr. R. V. Allison, Fiber Technologist, the Everglades Experiment Station, Belle Glade, Florida, December 18, 1956.

The development of the large, corporation-type farm was caused by (a) the great level stretches of arable soil; (b) the high cost of proper land preparation, including internal water control and intensive fertilization; (c) the heavy investment needed for machinery and equipment; and (d) the need for continuous experimentation in order to get the most out of the land. One veteran of agriculture endeavors in the area has held that the smallest economic farming unit is 80 acres, that 160 acres is better, and that farms of less than 320 acres are small-scale operations. He classes as large-scale operations only those farms in excess of 3,000 acres.[48]

THE PUBLIC ENTERPRISE APPROACH: THE FEDERAL GOVERNMENT

THE DEPARTMENTS OF THE TREASURY AND AGRICULTURE

While it is true that federal government agencies did not become involved as principal partners in the development of the Everglades water control project until 1930, they have participated in the project in various ways from the earliest plans to develop the region. Thus the first of a long series of reports on the desirability and feasibility of draining the Everglades was ordered in 1847 by the Secretary of the Treasury, then custodian of the nation's public lands. The Secretary acted on the request of Florida's Senator James D. Westcott. Prepared by Buckingham Smith and generally referred to as the Buckingham Smith report, this study was the result of a brief reconnaissance of the area by Smith. It contained an amazingly accurate physical description of the region, but it also gave official blessing to the popular idea that the whole vast area could be easily and cheaply drained by a few canals.[49]

The above report was the Treasury Department's only involvement in the project, but its role was quickly filled by the Department of Agriculture, an agency that, at least until 1947, remained the most important unit for gathering data, state, local, or federal, involved in the drainage project. The first report of the Department was the result of an investigation of the agricultural value of muck and peat soils carried out in 1891 by Dr. H. W. Wiley, head of the Chemistry Bureau. This report made the rather easy assumption that the organic soil of the area was valuable for agriculture, and concentrated mainly on consideration of a feasible drainage scheme for the central and southern Florida area.[50] The Drainage and Irrigation Investigations section of the Office of Experiment Stations, under the direction of Charles G. Elliott, made a preliminary investigation of the drainage project area in 1904, and after correspondence between Elliott and Governor Napoleon B. Broward, a more extensive investigation was carried out in 1907-1908. This study, under the direction of J. O. Wright, involved a considerable amount of field work, and was by far the most intensive engineering study of the area to that date. Even so, the amount of data available was very small, and Wright's recommendations for a drainage system contained little that was startling or new.[51] The report is perhaps best remembered for the long and bitter controversy that developed over whether or not, and in what form, it should be published. Very briefly, this complex and detailed story involved the premature publication of a "first draft" of the Wright report very favorable to the project; other engineers in the Department of Agriculture, including A. E. Morgan, challenged the accuracy of the report; the Department then published a circular much more pessimistic in its view of the project than the original Wright draft; Secretary of Agriculture Wilson suppressed the circular; and a long fight, including a full-scale Congressional investigation, then ensued. The dispute was concentrated on whether inefficiency, dishonesty, or both were involved. The investigating committee concluded that (1) the handling of the entire matter by the Department of Agriculture was "vacillating" and "most unfortunate"; (2) part of the trouble had been caused by differences of opinion among Florida's Congressional delegation; and (3) further difficulty was caused by the "irreconcilable differences" on engineering questions within the Drainage Investigations Division.[52]

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[48] Lloyd, *Agricultural Possibilities of the Florida Everglades*, pp. 13-16; Bitting, "Report on the Everglades and Contiguous Areas," pp. 30-31.

[49] U.S., Senate, *Report of Buckingham Smith, Esq.*, Committee Report 242 of Senate Reports, 30 Cong., 1 Sess., 1847, pp. 30-35; *Everglades of Florida, S.D. 89*, pp. 37-65.

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[50] *Everglades of Florida, S.D. 89,* pp. 94-96.

[51] *Everglades of Florida, S.D. 89,* pp. 131-137, 152-171.

The Department of Agriculture conducted a final research project prior to its broad program of the 1930's and 40's in the form of a 1915 soil study by the Bureau of Soils involving about 225,000 acres southeast of Lake Okeechobee. The conclusions contained in the resulting report maintained that the value of unimproved peat soil had been greatly overrated; that it required more intensive fertilization than had been generally believed; that frost was a greater danger than generally admitted; and that the drainage program was hardly even well under way, much less virtually completed, as some enthusiasts had claimed. This report was so unpopular in the Everglades region that all available copies were gathered and burned in a protest meeting in Ft. Lauderdale.[53]

THE CORPS OF ENGINEERS: TWO PHASES OF INVOLVEMENT

The Navigation Phase. Federal interest and actual participation in the water control problems of central and southern Florida coincides in time with the development of the Disston Drainage project. Early surveys by the Corps of Engineers are listed as studies of the Caloosahatchee or Kissimmee valleys, but actually such investigations involved both areas, since their object was usually to determine the economic justification for a waterway from the town of Kissimmee, in the upper Kissimmee Valley, down the Kissimmee River to Lake Okeechobee and through the Caloosahatchee River to the Gulf of Mexico. The first project approved involved a channel from the mouth of the

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[52] U.S., House, Committee on Expenditures in the Department of Agriculture, *Hearings, Everglades of Florida*, 62 Cong., 2 Sess., 1912, pp. 8-9, 111-118, 337 and *passim*. For a detailed account of the Wright Report controversy see J. E. Dovell, "A History of the Everglades of Florida," pp. 280-317.

[53] Mark Baldwin and H. W. Hawker, "Soil Survey of the Ft. Lauderdale Area, Florida," *Field Operations of the Bureau of Soils, Seventeenth Report, 1915*, U.S. Department of Agriculture (Washington: Government Printing Office, 1919) pp. 151 and *passim*.

Caloosahatchee to Ft. Myers. Work began on this 14-mile stretch in 1883, and a channel 7 feet deep and 100 feet wide was completed by 1885, at a cost of $9,456. This project was modified in 1888 and 1890 to provide for a survey of the Caloosahatchee River, snag clearance, and a four-foot channel from Ft. Myers up the River to Ft. Thompson. By 1891, $27,450 in construction costs and $122,136 in maintenance had been spent on the work. The Rivers and Harbors Act of 1899 authorized an examination and survey of a possible waterway from the Kissimmee River through Lake Okeechobee to the Gulf of Mexico. This survey resulted in the adoption of a project calling for a navigable depth of three feet in the Kissimmee River from Ft. Bassinger north to the town of Kissimmee. Commercial demands were held not to justify development of the entire waterway. The estimated cost of the work was $24,000, but though some work was done, the channel was not maintained at the authorized depth.[54] Under considerable pressure from the Florida Congressional delegation, the Corps of Engineers made a series of studies in the period 1909-1912 on the Kissimmee and Caloosahatchee rivers, and on Lake Okeechobee. These studies were aimed at determining whether or not it would be feasible to adopt a plan of improvement for these waters which would "harmonize as nearly as practicable with the general scheme of the state of Florida for the drainage of the Everglades." A special board of engineers, constituted to review the whole matter, concluded that: (1) there were grave doubts whether the state drainage plan would ever be completed; (2) it was "not feasible to coordinate state, local, and federal interests so as to lessen the cost of . . . improvements and compensate the government for expenditures in the interest of navigation"; (3) all state drainage projects should be supervised by the War Department to assure maximum benefits to navigation; and (4) the decision as to whether navigation improvements to the waters in question were justifiable depended on whether the state managed to carry out its drainage plans. Thus the Corps recommended a wait-and-see attitude, holding that it was not within the province of the United States under existing policy to undertake such a project. On this note the first effort by Florida to persuade the federal government to join in a water control project for the central and southern section of the state ended.[55]

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[54] U.S., House, *Examination of the Caloosahatchee River, Florida*, Executive Documents, Report of the Chief of Engineers, 46 Cong., 2 Sess., 1880, pp. 863-864; U.S., House, *Waterway from Punta Rasa to Ft. Pierce and Stuart, Florida*, H.D. 696, 76 Cong., 3 Sess., 1940, p. 17; U.S., House, *Examination and Survey of Kissimmee River, Florida, etc.*, H.D. 176, 57 Cong., 1 Sess., n.d., pp. 1-2.

Florida efforts to secure federal aid failed primarily because no general policy assigning to the federal government responsibility for flood control problems had been adopted. All federal projects involving flood control to 1912 were officially navigation works, with flood control benefits incidental. The need in the Florida project clearly involved much more than navigation, and since navigation remained the sole basis for federal participation in water resource development in the East, policy limitations blocked state efforts to secure federal funds.

The Second Phase: Indirect Flood Control. The second period of Corps of Engineers involvement in the central and southern Florida water control efforts can be characterized as the "indirect flood control" period. Other than deepening the Caloosahatchee River channel from its mouth to Ft. Myers, federal government assistance in solving the water problems of the area did not expand further until 1930, when the Corps of Engineers became a major participant in efforts to deal with the flood danger that had been dramatically demonstrated by the 1926 and 1928 hurricanes. Florida's Congressional delegation, led by Senator Duncan U. Fletcher and Congressman Herbert Drane, attempted all during the last half of the 1920's to win Congressional approval for large scale federal help, and a number of studies by the Corps were carried out to determine whether or not such participation was justified. It was not until after the 1928 hurricane disaster, however, that the state was able to overcome policy and cost sharing differences that had held up federal participation. Success came when the Flood Control Act of July 3, 1930, accepted the Corps of Engineers' navigation-flood control plan for the south Florida project. The plan called for (a) a channel from Stuart to Ft. Myers 6 feet deep and 80 feet wide as minimum measurements; (b) increasing the discharge capacity of Lake Okeechobee outlets by 2,500 feet per second through improving the Caloosahatchee River channel; (c) providing a 6 by 80 foot channel from Lake Okeechobee up Taylor Creek to Okeechobee City; and (d) enlarging levees on the south end of Lake Okeechobee and building new levees on the north end. The Corps established an office in Clewiston on the south shores of Lake Okeechobee and work began in November 1930. In 1937 a new lock for the St. Lucie River was authorized at a cost to the federal government of over $800,000. By 1947 a channel depth of 8 feet for the cross-state waterway had been approved, and about 85 miles of levee ranging in elevation from 34 to 38 feet had been completed. The navigation channel at that time was completed only to a depth of 6 feet, and measured a total length across the state of 155 miles. Federal expenditures for construction and maintenance on the project reached almost $23,000,000 by 1942, and in 1952 this sum had increased to $30,000,000, due mostly to maintenance costs.[56]

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[55] *Kissimmee and Caloosahatchee Rivers and Lake Okeechobee, Florida*, H.D. 137, 1913, pp. 1-32.

As soon as it became apparent in the late 1920's that there was a good chance for federal assistance in carrying forward the navigation-flood control element of the Everglades project, the closely related problems of the proper division of cost between federal and state-local participants, and the legal basis of federal participation, came to the foreground. The cost sharing quarrel that developed centered around (a) a contention by the Corps of Engineers and many Congressional committee members that the state as such had never contributed anything to the project, and that it was perfectly able to do so if it so chose; (b) a state contention that past expenditures by the Everglades Drainage District and other local units of government should be credited to the state in the cost sharing formula developed for any new project; (c) federal-state differences over the size of navigation benefits; and (d) a Florida contention that to require state-local interests to provide a large share of the costs would make passage of any bill useless, since the state and local units of government simply did not have the money to provide.

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[56] U.S., House, *Caloosahatchee River and Lake Okeechobee Drainage Areas, Florida, Interim Report, Chief of Engineers to House Committee on Rivers and Harbors*, H.D. 469, 76 Cong., 1 Sess., 1939, pp. 11-13; *H.D. 643, Corps Comprehensive Report*, pp. 27-28; *Okeechobee Flood Control District, Report to the Commissioners, 1929-1943*, p. 21; Florida, *Central and Southern Florida Flood Control District, Five Years of Progress, 1949-1954* (West Palm Beach: Central and Southern Florida Flood Control District, 1954), p. 9.

The contention that the state had not directly contributed anything to the project was based on the fact that all money spent on it had come from the proceeds of the sale of, or taxes on, the swamp and overflow land given Florida by the federal government under the Swamp Lands Act. State interests, although they had previously agreed with this position, held that credit should be given for all such expenditures, since the grant of land to Florida was unconditional. Estimates of how much the state had spent that could properly be credited to it in a cost division ranged from Corps acceptance of about $2,000,000 spent on navigation, to state claims of as high as $12,000,000. The unrealistic nature of this argument was heightened by the fact that the navigation benefits that were the basis of the federal and state figures were hoped for future benefits, not benefits existing at the time. The Corps at first approved a local credit of $2,000,000 (ultimately increased to $4,000,000) of the total $10,000,000 project cost. This credit was based entirely on earlier state navigation expenditures. Congress accepted the project plan, but reversed the cost sharing provision so that the federal government would bear two-thirds of the cost, the state one-third.[57]

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[57] U.S., House, *Report of the Chief of Engineers on Preliminary Examination of Caloosahatchee River, Florida, with a view to the Control of the Floods*, H.D., 690, 69 Cong., 2 sess., 1927, pp. 4-6, 16-20; *Caloosahatchee River and Lake Okeechobee Drainage Areas, Florida*, H.D. 215, 1928, pp. 47-54, 64-67; *EDD Biennial Report, 1927-1928*, p. 57; U.S., House, Committee on Flood Control, *Hearings, Flood Control in Florida and Elsewhere*, 70 Cong., 2 Sess., 1929, pp. 37 and *passim*.

The confused and contradictory state of federal water resources policy during the late 1920's is well illustrated by the struggle to win authorization for federal participation in the south Florida project. At first the Corps of Engineers consistently held that federal policy authorized participation only for navigation purposes, while state interests claimed that precedents in the Mississippi and Sacramento valleys allowed added participation on the basis of flood control. After the 1928 hurricane the Corps modified its view by holding that, while federal policy still restricted participation to navigation, the threat to human life justified crediting Florida with $4,000,000 in navigation benefits that did not yet exist, so that the federal government could take part in solving the flood control problem. This reasoning is well illustrated by a comment of General Edgar Jadwin, Chief of Engineers, in response to a question by Congressman W. M. Whittington of Mississippi as to how the federal contribution to the project had been justified. Jadwin replied:

> That is hard to answer, Judge. We discussed the flood control side and discussed the navigation side. Then we indicate that eventually this will be worth $4,000,000 to navigation. We indicate, as a normal river and harbor project, we would not recommend that at this time, but in view of the flood control and life saving we recommend Federal participation in this to exactly the amount that the future benefit to navigation is estimated at. That is done only because of the life and flood control propositions.
>
> Mr. Whittington: If I understand you now, whatever the ostensible reason for the recommendation may be, the fact remains it is primarily for flood control at this time?
>
> General Jadwin: That is primarily the reason.[58]

Confusion among the Congressmen themselves as to the state of federal water resource policy during the 1920's was indicated by the following exchange between Committee Chairman Frank R. Reid, Congressman Whittington, and Florida's Attorney General Fredrich H. Davis:

> Chairman Reid: You don't understand that the control of floods is a federal duty, do you?

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[58] House, Committee on Flood Control, *Hearings, Flood Control in Florida and Elsewhere*, 1929, p. 234.

> Mr. Davis: It is when it is connected with navigable waters the United States asserts jurisdiction over.
>
> The Chairman: I tried to put that over last year, but was unable to do it.
>
> . . . .
>
> Mr. Whittington: I differ with you. I think you did put it over.
>
> The Chairman: Where?
>
> Mr. Whittington: In the Sacramento.[59]

Out of this nebulous state of affairs may be extracted the certain fact that the federal government did participate in what was essentially a flood control project, and in fact had assumed virtually the entire cost of the works prior to the enactment of the Flood Control Act of 1936.

During the 1930's and 1940's, the Corps of Engineers did not serve as a leader in promoting programs for gathering data, or in pressing for an overall, comprehensive water control plan for the central and southern Florida area.[60] However, they did hold a series of hearings in the area between 1941 and 1946, and when the disastrous flood of 1947 created a political atmosphere favorable to the adoption of an overall project, the Corps was able to step in and draw up such a plan. The Corps acted under policy changes made in the Flood Control Acts of 1936 and 1944, and drew for the most part on data furnished by the comprehensive data gathering program of the late 1930's and 1940's described below.

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[59] *Ibid.*, p. 138.

[60] In 1940, a Corps review of the central and southern Florida area noted that "the proposed improvement cannot be combined with a project for power development, for flood control, irrigation, or land reclamation or other works so as to reduce its costs to the United States. No question of wildlife conservation or abatement of pollution is involved." See *Waterway From Punta Rasa to Ft. Pierce and Stuart, Florida*, H.D. 696, 1940, p. 41.

THE COOPERATIVE DATA GATHERING PROGRAM OF THE 1930'S AND 1940'S

The joint program to gather and analyze data was a cooperative venture involving both state and federal agencies. In fact, however, at least half of the money was provided by, and virtually all of the actual work performed by, the United States departments of Agriculture and Interior. The Department of Agriculture's Bureau of Agriculture Engineering launched the initial phase of the program in 1932, becoming the first federal agency to undertake a sustained program of data gathering designed to supply the information necessary to devise a soil and water control plan for the Everglades. Though limited by the money available, important studies of rainfall, temperature, evapotranspiration, soil subsidence problems, and an analysis of the existing methods of farm water control were made, and the results were published in 1942.[61]

The increasing complexity and gravity of water problems in southeastern Florida, added to an atmosphere favorable to coordinated planning that grew out of depression years experience, encouraged the evolution of new approaches to an old problem. In 1939 the Southeastern Florida Joint Resources Investigation, under the sponsorship of the Florida State Planning Board and the National Resources Planning Board, was established. Such familiar names in the history of Everglades water control as R. V. Allison, H. A. Bestor, Fred C. Elliot and W. Turner Wallis served on the advisory committee to this organization. The National Resources Planning Board supplied a small staff headed by a coordinator to help unify the efforts of the various state and federal agencies. The object of the investigation was to set forth in the form of a combined report a long-range plan of land and water resource development for southeastern Florida. Original plans called for state agencies and technicians to participate widely in the program, but little of this phase of the cooperative effort ever materialized.

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[61] B. S. Clayton, J. R. Neller, and R. V. Allison, *Water Control in the Peat and Muck Soils of the Everglades*, Florida, Agricultural Experiment Station Bulletin 378, 1942, pp. 5-74.

As outlined in 1940, the cooperating agencies in the Department of Agriculture included the Soil Conservation Service and the Bureau of Agricultural Economics as the principal participators, with the Bureau of Entomology and Plant Quarantine, Bureau of Plant Industry, and the Bureau of Agricultural Chemistry and Engineering taking part as they were called on to do so. The Soil Conservation Service aims were described as: (1) a synthesis of existing data; (2) provision of aerial photographs on which to orient other data; (3) detailed soil surveys, including the extent of developed and undeveloped agricultural land, the depth and character of the soils, the nature of the supporting subsoil, and the extent of burned areas of soil; (4) a water investigation in cooperation with the United States Geological Survey to determine such things as irrigation requirements and methods of controlling ground water levels; and (5) a study by the Bureau of Agricultural Economics of farm management problems, population and community life, taxation and fiscal problems in relation to land utilization, and an analysis of existing and needed legislation.

The Geological Survey was the major contributor for the Department of the Interior, and the general aim of its studies was to provide fundamental data on which to base much of the land utilization studies by the Soil Conservation Service. Included were surface water surveys made through stream gauging stations, rainfall and evaporation stations, and also involving chemical analyses of surface water supplies. The second phase of the study called for ground water investigations, employing test and observation wells to measure permeability, yield, and water-bearing ability of different geological formations, as well as to make observations about water levels and their fluctuations. Finally in these ground water studies special emphasis was given to the salt water contamination problem. The Biological Survey (later renamed the Fish and Wildlife Service) participated in relation to wildlife problems. The War Department, through the Corps of Engineers, was to take part by making available all the data it had gathered in the process of developing its projects in the area. The National Resources Planning Board was to aid in the preparation of the final report.[62] The Geological Survey began actual field work on the program in 1939, using matching funds provided by Miami Beach, Coral Gables, and Dade County. The immediate occasion of this action was the salt water intrusion crisis that threatened the water supply of several lower east coast cities, including Miami. While the National Resources Planning Board and the Florida State Planning Board both became victims of a post-1940 reaction against the "planners" of the 1930's, the cooperative project continued, field work was completed by 1947, and the comprehensive report was published in 1948 as Bulletin 442 of the Florida Agricultural Experiment Station. The publication listed the cooperating agencies as the State Agricultural Experiment Station, the Soil Conservation Service, the United States Geological Survey, and the Everglades Drainage District.[63]

Bulletin 442 is one of the most important documents ever to appear in connection with water control efforts in central and southern Florida. On the basis of the extensive effort over almost a full decade to gather and analyze data, this document proposed a comprehensive water control and reclamation plan to replace the haphazard fumblings of the past carried out for the most part in ignorance of the hydrological data so necessary to any effective plan. The basic plan called for improving the main drainage canals already existing, only one of which had ever been dug to planned depth, and the addition of main and secondary canals sufficient to provide water control for the areas set aside for agricultural development. Furthermore, the study designated some 700,000 acres of land in the upper Everglades for long-range agricultural development. Knowledge gathered from the study made possible the selection of this particular area of land on which to concentrate future agricultural endeavors. The area selected was the deeper muck and peat soil underlaid by relatively impermeable

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[62] Stanley H. Wright, "The Southeastern Florida Joint Resources Investigation, A Brief Description of its Purpose and Organization," July, 1940, pp. 1-11 (typed manuscript used through the courtesy of W. Turner Wallis, Chief Engineer, Internal Improvement Fund).

[63] *Ibid.*, pp. 9-10.

Ft. Thompson formation limestone and/or a layer of sand or marl between the limestone and peat, one or the other of which was necessary for effective water control by diking and ditching.[64]

By the same token, the second major feature of the plan involved the establishment of large water conservation areas which had their boundaries marked in accordance with the thinner peat soils underlaid by the extremely permeable Miami oolite or Tamiami formations. Another type of soil classified as unfit for agriculture was the extremely loose and waterlogged peat soil located mainly in the Hillsboro Marsh area southwest of West Palm Beach. The Hillsboro Marsh section comprised the first water conservation area, while the second lay in Broward County toward the lower eastern Everglades, west of Pompano and Ft. Lauderdale. The third and largest conservation area was located in Broward and Dade counties, and extended north from the Tamiami Trail toward Lake Okeechobee. These areas were proposed in order to serve multi-purpose water control benefits, and in particular to hold water on unused land and thus prevent its burning away; to raise the general water table of the area and thus combat salt water intrusion into the water supplies of the lower east coast urban areas; to provide a source of irrigation water; and to help ameliorate winter temperatures. Various proposals for structures for holding water in these areas were included. As noted above, the Everglades Drainage District had already acquired much of this land for this very purpose. Acquisition of the water conservation areas, the building of dikes in order to hold water in them, the construction of numerous new canals, and the provision of water control structures in the canals where needed comprised the essence of the plan, and its cost was estimated at $17,298,000. Perhaps the most conspicuous omission in the report was a consideration of the continuing need for progressive drainage. The report's vital importance lies in the fact that for the first time sufficient knowledge was at hand concerning the geology and soils of at least part of the area to allow a basic decision, based on facts, as to what sections could be successfully developed for agriculture and what should be set aside for re-watering in order to gain the multi-purpose benefits that would come from such an operation.[65]

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[64] *Soil, Geology, and Water Control in the Everglades, Bulletin 442*, pp. 107-135, 141-165.

CONCLUDING ANALYSIS

This study has traced water resource development in central and southern Florida from 1845 to 1947, with the end in view of pointing up the mistakes, failures, and successes of the efforts to solve the water problems of the region. Special emphasis was placed on administrative, economic, and governmental cooperation problems, considered within the framework of a summary of the nationwide aspects of the questions involved. Physical problems were treated only as they related to the economic and administrative aspects of the situation.

As a problem in public administration, the project during the 1845-1947 period is more significant for its failures than for its successes. During the years when the development was almost entirely in the hands of state and local government, the principal agency, the Everglades Drainage District, was not well organized to carry out its responsibilities in an effective and efficient manner. Only at the very end of the development period under consideration, in the late 1920's, was any considerable attention given to the need for a decentralized organization in the fulfillment of its goals. The absentee, ex-officio board system could not and did not supply the kind of sustained administrative or policy leadership and direction that was needed. These weaknesses, of course, are one chapter in a long record that points up the general problem of administrative dispersion in water resource development. The single purpose orientation of many of the agencies of government at all levels during this period, coupled with the absence of any means for bringing about effective coordination of the large number of federal, state, and local agencies concerned with the project, resulted in a failure to deal adequately with the problems of the region.

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[65] *Ibid.*

The failure to cope with the complex water problem in central and southern Florida stemmed directly from the failure of the state legislature, and of the administrative agencies involved, federal or state, to assume responsibility for carrying out the kind of long-range program of research and planning that had to precede any comprehensive plan that would allow full utilization of the area's resources. Since the development of the project during this period was largely the responsibility of state and local agencies, the greater part of the blame for this unsuccessful effort must be attributed to them. Confused and divided responsibility between the Everglades Drainage District, the Internal Improvement Fund, and the Okeechobee Flood Control District, and the failure of the state legislature to do anything to correct this situation, resulted in the prosecution of a drainage program based on inadequate data. The result was a series of unexpected consequences causing the destruction of much of the resource base of the area, and the failure to develop any of the region as fully as it could have been developed under a well-based, comprehensive plan. Thus the destruction of much of the valuable and unique wildlife of the region, the pollution through salt water intrusion of much of the lower east coast municipal water supply, the lowering of winter temperatures, and a continued cycle of too much and too little water, all stemmed at least in part from a failure to understand the complex nature of the water control problem. Much of the damage done to wildlife and to the valuable agricultural soils during this period can never be corrected, and must be written off as another in a lengthy series of examples of careless and destructive use of the natural resources of the United States. While the Corps of Engineers' diking and channel project of the 1930's virtually eliminated the danger of loss of life from hurricanes, it did little to promote an overall approach to the water control problem.

As a problem in economics, the development of the project during the 1845-1947 period reveals a number of fundamental weaknesses. In spite of the generally conceded need for a realistic benefit based assessment of taxes that would charge land holders for the benefits they received, such a plan was never worked out. This failure was directly linked to the lack of a comprehensive physical plan that would have allowed a realistic prediction of benefits that would accrue to the various lands in the area. Lacking such a plan, the benefit tax method had to be applied according to a more or less arbitrary legislative assignment that often led to major inequities in assessment. Thus the entire area was assessed at some rate, even though much of the land was later revealed as unfit for cultivation of any kind. This situation was closely linked to the consistent underestimation of the cost of the project, which resulted in recurring breakdowns of the economic plan.

The faulty assessment problem was also related to the failure of either the administrative agencies involved or the state legislature to face realistically the need for basic policy changes in the project. For instance, considerable curbing of the so-called free enterprise approach was clearly necessary if a detailed reclamation plan, including the indispensable progressive drainage principal, was to be possible. This is best illustrated by the land sales policy of the Internal Improvement Fund. The Fund policy never recognized the need for a logical pattern of unit development, but rather allowed land to pass into private ownership throughout the Everglades without any developmental restrictions. This policy, in turn, was necessitated by legislation that required the Fund to pay taxes on its land in the area without providing any source of funds other than land sales. Thus the whole project was caught in a vicious circle of inadequate physical, financial, or administrative planning, with each weakness feeding on the other in such a manner as to render impossible the full and effective development of the water resources of the area.

One of the most interesting and significant aspects of federal-state efforts to cooperate in meeting the water problems of central and southern Florida during the period treated was the emergence of disputes over the proper division of the cost of the project between federal and state interests. This problem has continued to complicate efforts at intergovernmental cooperation in the project, and probably will be a major bone of contention in the future. The nature of the disagreements over the proper division of costs not only pointed up an early instance of this continuing nationwide problem, but served also to highlight the general confusion in federal water policy that hampered cooperative efforts to plan and execute a comprehensive water control project. While much of the failure of the project was due to shortcomings in the areas of economics, administration, and coordination at the state level, confusion in national water policy also had an unfavorable impact on the effort. The long struggle to win participation by the federal government in the project was constantly confused by questions of the nature and extent of federal responsibility for flood control and other aspects of water resource problems. The project was peculiarly one which demanded a multi-purpose approach, yet until it had fallen into financial insolvency, national water policy did not allow a general federal government participation in the work.

As a problem in intergovernmental relations, the project during the 1845-1947 period was characterized not so much by conflict between agencies as by a failure of agencies to join together in a vigorous effort to solve the overall water problem. When the need for such a concerted approach was finally recognized in the 1930's, the financial condition of the state agencies involved precluded their taking a significant role in gathering data during the 1930's and 1940's. The experience gained during this period served to point up the absolute need for some one agency with both the authority and the desire to act as a central clearing house through which the efforts of the many federal, state, and local agencies could be channeled. This vital ingredient of any really effective effort to deal with the water problems of the area was never achieved during the 1845-1947 period. However, the obvious need for such an arrangement did much to support the post-1947 efforts of the Central and Southern Florida Flood Control District to function as such a central coordinating agency.

In conclusion, some of the accomplishments of the project during this period must be restated. Efforts to drain the area did result in reclaiming a considerable body of valuable soil that produced large amounts of winter vegetables and other crops, mainly for the northern market. The central fact remains, however, that these accomplishments were achieved at a very high cost in terms of needless destruction of irreplaceable natural resources. It may well be that the most significant result of the entire effort during the period 1845 to 1947 was to demonstrate two basic premises that hold in efforts to develop almost any water project: (a) in a large scale project, the physical problem is apt to be extremely complex and involved, while the data available on which to base physical plans is almost certain to be grossly inadequate; (b) the existence of a federal system, inevitably involving all three levels of government in any major water project, creates problems of interagency coordination that must be met if the basic purpose of dealing effectively with the water problem is to be achieved. Difficulties growing out of these two premises during the 1845-1947 period were never satisfactorily resolved, but the attempts to meet them did furnish valuable guidelines for the more comprehensive effort dating from 1947.

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